107
HOME OFFICE.

DEPARTMENTAL COMMITTEE

ON

HUMIDITY AND VENTILATION IN FLAX MILLS AND LINEN FACTORIES.

MINUTES OF EVIDENCE.

Presented to both Houses of Parliament by Command of His Majesty.

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12	Arthur Thomas Herdman[2]	Immediate Past President of the Power Loom Manufacturers' Association.	900–1045
13	John Elder MacIlwaine, M.D., B.Sc., D.P.H.	Certifying Surgeon	1046–1133
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16	John Barbour Morrison[1]	Manager, Wolfhill Spinning Co., and Partner in Morrison & Metcalfe.	1418–1539
17	Alfred Ernest Adams[1]	Manager, Ulster Spinning Co., Ltd., Linfield Mill	1540–1652
18	T. Jackson Greeves[2]	Managing Director, Portadown Weaving Co., Ltd.	1653–1790
19	Thomas H. Spence[2]	Director, Spence, Bryson & Co., Ltd.	1791–1859
20	George Elliott Lutton[2]	Manager, Spence, Bryson & Co., Ltd.	1860–1960
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65	Walter Yates	Managing Director of Matthews and Yates, Ltd., Ventilating Engineers.	4491–4584

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[1] Nominated by the Flax Spinners' Association.

[2] Nominated by the Power Loom Manufacturers' Association.

[3] Nominated by the Ulster Weavers' and Winders' Trade Union.

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DEPARTMENTAL COMMITTEE ON HUMIDITY IN FLAX MILLS AND LINEN FACTORIES.

MINUTES OF EVIDENCE

TAKEN BEFORE THE

DEPARTMENTAL COMMITTEE

ON

HUMIDITY AND VENTILATION IN FLAX MILLS AND LINEN FACTORIES.

FIRST DAY.

Friday, 13th September 1912.

At Belfast.

PRESENT:

COMMANDER SIR HAMILTON FREER-SMITH, R.N., C.S.I. (*Chairman*).

Mr. HENRY CUMMINS
Mr. HERBERT EWART

Professor J. E. PETAVEL, F.R.S.
Professor J. LORRAIN SMITH, F.R.S.

Mr. D. R. WILSON (*Secretary*).

Mr. SIDNEY ERAUT called and examined.

1. (*Chairman.*) I do not think it is necessary to go into the object we have in view in conducting this Inquiry. That is perfectly well understood?—Yes, that has been communicated to me.

2. You are inspector-in-charge of the North of Ireland?—The north-east district—Belfast district.

3. How long have you been an Inspector of Factories?—About 18 years.

4. And you have served in various districts?—Yes; London, Liverpool, Bristol, Norwich, Newcastle-on-Tyne, Preston, and Belfast.

5. How long have you been in Belfast?—About 4½ years.

6. Have you had ample opportunities of seeing the mills and factories?—Yes. I have not visited all the spinning mills and factories, but a representative proportion of them.

7. Now, have you formed any opinion in regard to the effect of working in hot, humid temperatures from a health point of view?—I have not travelled on to that ground at all practically, because I understood it was all highly controversial; but I have, perhaps, seen a little of the effects of it. It would be difficult to generalise or particularise what I have seen of it. One might say I have made practically no investigation.

8. Have you been in communication with any medical authorities on the question?—I have from time to time, from this point of view: to ascertain their views and to get figures if possible; but it seems to me more or less impracticable to obtain reliable statistics.

9. Have you, from inquiry or otherwise, formed any opinion as to what relative humidity is necessary for weaving, taking into consideration the different kinds of goods that are manufactured?—No, I have only made inquiry, not exactly as to what is necessary, but what is usual. To go beyond that I have regarded as somewhat indefinite and rather vague, because I understand there are so many considerations. I mean practical considerations. For instance, taking humid weaving, the geographical situation of the shed has, I understand, a considerable bearing on the matter; also the nature of the article to be produced, and the nature of the yarn used in producing it.

10. Have you been able in any way to classify what is necessary for the different kinds of materials that are manufactured?—No. I have a small investigation of that in progress at the present time, but unfortunately I have not had time to prepare sufficient material. I have a few notes.

11. Unless you can give us any definite information it is hardly necessary to go into it, but I recognise it is very technical?—Yes. I would not like to mislead you by giving just a few different readings one has noted. There are various considerations I recognise which may render them misleading rather than point to any definite direction.

12. Now, you have put down on your minutes here several items relating to exhaust ventilation as affecting CO_2. That does not come within our inquiry?—I rather gathered that was more or less outside, but I thought possibly you might want to travel into it. It only indirectly affects it in one or two directions.

13. We do not want to open any questions other than those directly before us?—Yes. For instance, I can give you just one instance to show why I said it might affect it. In preparing rooms now we have a large amount of exhaust ventilation, and that has a distinct effect on humidification.

14. I think you mentioned that?—Yes. I think it is possibly lower down. A man, say, would have humidification in addition in the atmosphere. We come along and say, "You must take away the "dust out of this room by exhaust ventilation." He puts in an installation, taking out per minute a huge volume of air. The incoming air must affect the degree of humidity, but it would be impossible for me to give you readings of humidity before and after the ventilation is applied. I could not give you those

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15. With regard to the question of CO_2, will you just state exactly what the law is in regard to the parts of CO_2?—It is practically a standard of nine volumes in 10,000 during daylight, and of 20 volumes during gaslight. That is roughly. The exact reading is in Regulation 1.

16. Let us have it exactly?—The regulation is "In "every room in which persons are employed the "arrangements shall be such that during working "hours the proportion of carbonic acid in the air of "the room shall not exceed 20 volumes per 10,000 "volumes of air at any time when gas or oil is used "for lighting (or within one hour thereafter) or "12 volumes per 10,000 when electric light is used "(or within one hour thereafter), or 9 volumes per "10,000 at any other time. Provided that it shall be "a sufficient compliance with this regulation if the "proportion of carbonic acid in the air of the room "does not exceed that of the open air outside by more "than 5 volumes per 10,000 volumes of air." Well we have made a number of tests. The way I make the test is: I fill small bottles with the air from the room and send four or five of these to the Home Office, and there they are analysed by an independent analyst, who does not know the room or the place from which the air comes or anything about it. The result of those tests covers a period before I came. My predecessor took more of these than I have done, because it was very soon recognised that you might practically eliminate the air test from some of the rooms which were within the limits.

17. What rooms are those?—The wet-spinning rooms. In regard to volumes of CO_2 per 10,000 of air, as shown by this test, out of 91 samples taken there was one over 10, there were two over 9, and there were two between 8 and 9, and 86 less than 8.

18. (*Professor Petavel.*) That is during night or gas light?—No, daytime. Now, in preparing rooms, out of 12 samples there was only one over 9. The others were all less than 8. In reeling rooms, on the other hand, there is shown a higher proportion of CO_2. Out of 56 samples 16 were over 9 and 40 were under 9.

19. (*Professor Lorrain Smith.*) How much over 9?—There were 12 of them over 10. I cannot give you the hour of the day at which they were taken. It could be ascertained.

20. Yes, that can be filled in?—I can tabulate it further, but I have not done so.

21. (*Professor Petavel.*) You could put that into writing perhaps?—Yes. Suppose I tabulate these further? Would it meet your view if I group them as we generally do for the Home Office? I generally tabulate results thus—over 8 or over 10 or over 11 or 12, to the critical point. They generally go to 12 or 13, not above 13 for reeling. These are usually the only samples I take in spinning mills. Now, coming to weaving. Would you want those now?

22. (*Chairman.*) Yes, please?—The next are weaving. Now, unfortunately, I cannot tell you from this anything about the weaving, except to distinguish between dry weaving and humid weaving. I cannot tell you whether it is damask or plain, or what it is. I have divided the weaving up into wet weaving or humid weaving, winding and others such as warp dressing and one or two other processes—drawing in. Now, out of 39 dry-weaving samples 14 were over 9.

23. Can you say how much over 9?—Ten of them are over 10. I cannot take that further now, but I can do it if you wish, and separate them later.

24. (*Professor Petavel.*) It would be interesting to know the exact maximum?—Yes, frequently 9 or something over. Fourteen were over 9. Six of them were between 9 and 10.

25. Would there be any 15, 16, or 18, or any high percentages?—Yes, but not very high. I do not recollect anything very high. I think they are nearer the lower limit, because most of these samples were taken according to our general arrangements to avoid sampling within an hour after they have discontinued artificial illumination. We wanted to get as near as possible a true value of the ventilation. In humid weaving there are 163 samples. Fifty-seven of those are over 9, 39 are over 10, but eight of those 39 were not sampled by me, they were taken by lady inspectors, and the note I have is, "gas in use at the time."

26. (*Professor Petavel.*) They should be weeded out?—They are specially mentioned like this. There were, out of 39 over 10, eight taken during gaslight, and they are fairly high. I think they are mostly at one place, but I did not take the samples. I had the result. These were tested at the mills at 5.15 p.m. on the 2nd February 1911. That is in the winter months. One of the highest is 39·2, and the next is 29·9. I cannot say if they are two sheds of one firm or two in the one shed, but at any rate those are the results given when gas was in use.

27. (*Chairman.*) This is gaslight?—Yes.

28. And the limit we had just now is?—Twenty.

29. That went up to 39, you say?—Yes, 39·2.

30. Is there any record as to whether the ventilating appliances were working at that time?—I have no record. That could be ascertained from the lady inspectors. I am only giving the group samples of the whole district. Probably Miss Martindale would supply that definitely.

31. That has an important bearing on it?—I think they have Hart's humidifiers there now.

32. In cotton cloth factories there is now no standard of ventilation during gaslight, but it is provided that all the appliances for ventilating shall be kept in use. Is not that so?

33. (*Secretary.*) That is so.—I can turn up that exact shed and tell you the daylight samples which we took.

34. (*Chairman.*) It is important to know whether the ventilating appliances were kept running at that time?—Yes.

35. You might make a note of that, to get the information if you can?—That can be obtained. I was going to give you the rest of those eight, if you wish them. I have given you two—39·2 and 29·9. Further on in the month samples were taken at 5.20, 5.30, and 5.40 by the lady inspector, with a Haldane apparatus. That showed 22, 22 and 27. That is earlier in the evening. Some others were taken at the same firm by the Haldane apparatus on the 16th February of this year—that is, a year later—and they show 16, 20 and 16. Miss Slocock has supplied me with those so as to complete my return. I have no record of the time, but I have ascertained gas was in use. I will turn up my daylight samples of that shed if you like. There are also two humid weaving sheds that Mr. Williams tested on the 27th February 1907. One showed 5·7 and when tested again on the 18th May 1907, 4·7, and the other weaving shed, tested on the 27th February, showed 7·1. Those would be daylight samples. I cannot tell you the humidifying plant there.

36. Have you any further information in regard to CO_2?—Yes, I have some more CO_2 results. I have given you the wet weaving. In winding rooms, out of 70 samples taken, 18 are over 9, but 45 are less than 8. In other rooms in weaving factories, such as warp dressing, and so on, there were 15 samples taken and only two are over 9. I have not taken any samples in the other rooms of spinning mills, such rooms as roughing, sorting, machine-hackling, carding or preparing, where exhaust ventilation has been installed, because there is no doubt they would come well below the limits.

37. Have you had any representations from manufacturers or others in regard to the CO_2 question?—I have from one firm. I tested them. They were very near the limit, and they rather objected to putting in additional ventilation; but I understand they have put it in since. They were so very near the limit, it was just a question of a point or so in excess. There was only one case, but in other cases, I ought to say, wherever we have found them over the limit we have written to the firms, and I think I should be right in saying that any defect has been remedied in every case.

38. There has been no serious question in regard to CO_2?—No, generally my view has been accepted.

39. Talking of spinning rooms, you know that by the recent regulations there is a standard of purity for the water in the spinning rooms?—Yes, there is.

40. Have you any questions which have arisen with regard to that?—I have looked into that frequently. I have generally ascertained that the water was taken from a reputed sufficiently pure source, but just recently I have been making chemical tests of some, and I have ascertained that in two cases the water was very much over the limit; that it was not sufficiently pure.

41. What was done in that case?—It was only last week they were taken. One instance is that of a humid weaving factory using partly river water. They take their water from the condenser discharge It is a jet condenser and the water runs through They take their water for humidifying there and throw it over a screen through which a fan sucks air and blows it into the shed. That water was much over the limit. It is rather a delicate test, an awkward one to apply unless you have a complete apparatus handy. But I had another decidedly suspicious sample in which the water is taken from the River Bann and presumed to pass through a sand filter. The water was undoubtedly beyond the limit of purity. It is only yesterday I analysed that water

42 Have any measures been taken for complete analysis of the suspected water?—No. I made an analysis of it as regards the requirement of the regulation, and I find it beyond the limit, but I cannot tell you the amount of free oxygen. I did not pursue the analysis to that point

43. These questions are still open, I take it? It is not finally decided?—Yes. A number of firms have themselves recognised the difficulty of obtaining good water, and in Belfast a large number of them use the town water

44. I wish to confine myself to the definite cases?—The two definite cases are still open, yes.

45. Of course naturally enough the firm would wish to have a thorough analysis made either by themselves or on behalf of the Government, or both. Assuming your analysis is confirmed, steps would naturally be taken to remedy the defect?—Yes

46. Beyond these two particular cases have there been any acts done or representations made in regard to the purity of the water for humidifying air in the weaving sheds?—I cannot call one to mind at the moment. At any rate it is not notorious. There might have been a few isolated cases, but nothing notorious in the way of complaints made.

47. Nothing in the form of a consensus of opinion?—No.

48. (*Professor Lorrain Smith.*) How did you find those two cases?—I tried four samples—pot shots at what I thought would be suspicious water Here is a river receiving sewage, and another one is receiving sewage from two or three towns, and I thought it worth trying.

49. There was nothing obvious to lead you to make the tests?—No, nothing obvious. There is another thing The water might be taken from a pure source, but probably one ought to investigate the tanks in which it is stored at the mill.

50. (*Chairman.*) You want to know the condition in which it goes into the shed?—Yes I took the sample in the mill or in the shed immediately before it was dispersed. There is another point I would like to draw attention to. The water in the troughs becomes fouled very much in the process of spinning, and my own view—mind, it is not a scientific view—is, that it is more important to keep the troughs clean than the water that goes into them I think washing the troughs is the more important.

51. The water goes into the trough?—Yes.

52. And you think it gets foul in the trough?—Yes

53. Now of course the trough is carefully covered over?—Yes.

54. And the steam is either drawn off or prevented from escaping into the room?—A little always escapes—a very small amount perhaps.

55. The source of danger you anticipate from impure water in the trough would be from the sprinkling?—The sprinkling and any steam that comes off.

56 Have any analyses been made or anything? Is there any definite opinion as to the condition of the water in the troughs?—No. I think a rule of thumb process is used to this extent, that if a firm intend to spin stuff which has to be very nice in finish then they clean the troughs more often; otherwise they use a practical rough judgment as to frequency of cleaning the troughs. It is a difficult matter. I would not like to lay down any rule or suggest any. I suggest a source of contamination, and cleansing of the troughs to remedy it.

57. You suggest a source of impurity; would you suggest any remedy?—I would hardly go as far as that. A remedy might be sought in two or three directions, either by the use of disinfectants or more frequent cleaning; but I have not pursued the matter sufficiently far to justify me in formulating an exact recommendation. At the same time I would not like to suggest a recommendation which one could not easily enforce.

58. Would you make any suggestion in regard to having analyses made to confirm your opinion?—I would I think some analyses should be made.

59. Because, of course, no action could possibly be taken without due investigation?—Yes, I think it is a matter for investigation. I would not like to say more than that I recommend cleansing of the troughs.

60. Before you go further I want to refer exactly to the regulation as to water. Regulation No. 6. "No water shall be used for producing humidity of " the air, or in wet-spinning troughs, which is liable " to cause injury to the health of the persons employed " or to yield effluvia; and for the purpose of this " regulation any water which absorbs from acid " solution of permanganate of potash in four hours at " 60 degrees more than 0·5 grain of oxygen per " gallon of water shall be deemed to be liable to cause " injury to the health of the persons employed"?—I do not anticipate much trouble from steam coming from water which is absolutely boiled, because everything is quite sterilised; but the water in these spinning troughs is not absolutely boiled, yet I suppose everything is inert except free ammonia The temperature in the spinning troughs varies. There is a great variation—anything up to nearly boiling point.

61 (*Professor Lorrain Smith.*) There would be nothing alive?—No. There is one point on that not covered by the regulations There is a trough and the rove issues here (*indicating*). In some factories there is another pipe bringing water which drips down on to the second roller. There is nothing in the regulations dealing with that water, and the proportion of this water thrown off seems to be rather larger than the proportion thrown off there.

62 (*Chairman.*) Is not that covered by Rule 6?—It is not covered by the rule

63. (*Professor Petavel.*) You suggest it should be?—I think it should be included. If there is anything at all in the question of purity of water I think this should be included, because the same water used in the spinning troughs would be used there.

64. (*Professor Lorrain Smith.*) Where does the impurity that accumulates come from?—From the yarn

65 (*Professor Petavel.*) You think it is a decaying of the vegetable matter?—Before the yarn comes to the spinning troughs at all the flax has undergone a process of decomposition, and I suppose the surrounding cells are broken down into dust. There is a mixture on that yarn of what is really dust. At any rate, it is deposit of something. It may be absolutely inert—I cannot say—but this dust is mixed with the natural gum which holds the fibres together. The water in the troughs softens that gum, and there is no doubt whatever that it takes out from the fibre a certain amount of dust or dirt, and gum, and holds part in suspension.

66. (*Professor Lorrain Smith.*) What reason have they for renewing the water more frequently when they are doing finer work?—The yarn might become stained.

67. Staining is the point?—Yes, I understand staining is the whole point.

68. Does the water vary in its effect at all as the process goes on?—I cannot say that. I have not heard it mentioned in the case of flax.

69. Is there any selection in water? Is one water better than another?—I believe there is a good deal in that. I think that is undoubted, because I had one firm who put in a chemical solution which had the effect of softening the water. Now I have another firm who spin entirely with cold water.

70. Was that a success, softening the water?—I understand sodium hydrate was put in. I am not sure, but I understand the object was to soften the water, and they were able to spin at a lower temperature. They had practically cold water in those troughs. There is another mill I have in mind where a man spins with cold water entirely, and I understand that the reason is that the water is delightfully soft, and that they are able to do it for that reason.

71. Rain water?—It is undoubtedly rain water. The water of course varies a great deal. Some of the water is mountain water, as in Belfast; but as to the softness I cannot say.

72. You think there is a difference?—I understand so. I have never investigated very far. There is a great diversity of opinion as to the proper temperatures for water. I understand there is a great diversity of opinion as to the proper temperature for spinning and also as to the temperature necessary for handling and treating certain flax.

73. You suggest the temperature may vary according to the quality of the water?—Yes, it may vary according to that.

74. But there is nothing definite?—No, nothing definite. There is much greater variation on account of the nature of the material to be handled. Undoubtedly there is great variation there.

75. As regards temperature?—Yes. That depends on the material they are spinning.

76. (*Chairman.*) I should like to ask your opinion as to the condition of the floors in the wet spinning rooms. Do you consider that they are kept as dry as they might be kept?—I think so. There is the camber or curve of the floor—that has a bearing on it, and another thing is the splash guard.

77. We will come to that afterwards?—Those are what I call external things which affect it. Then with regard to the internal matters which affect the floor, there is as much variation in that as in the other question, because I find the wetness of the floor depends, or the amount of water thrown off depends very much—well, entirely—on the yarn being spun.

78. Yes, but do you consider the drainage is in every case satisfactory or sufficient?—In the average very good. In a few cases of older mills there is undoubtedly room for improvement, but they are conditions that vary from year to year. For instance, a fair floor to-day wears bad in a short time, but they are gradually being renewed with better tiles.

79. What is the condition of the floors where splash guards are used?—Very dry.

80. Very dry?—Very dry.

81. Have you been able to gauge the opinion of the workers in regard to the use of splash guards?—Where the workers are told they have got to use them they get accustomed to them and will use them, but frequently they object. They tell me they are in the way to a small extent.

82. Can you tell me whether there are any sheds where they are in use?—Yes.

83. Of course I know there are many where they are in use, but I meant for all pitches?—Yes, there is one mill where they are in use except in one large room. I cannot tell you just now what they spin, but all the frames have splash guards.

84. Can you tell us anything about the pitch of the frames?—They are wide stands. I have been measuring a few recently. The one I had in mind was a very narrow frame. It is in a Belfast mill. It is usual to measure from the gable end of the frame, but to be more definite and exact I have measured from the centres of the spindles, and there is a splash guard on each side. From centre to centre is 3 feet 10 inches.

85. (*Mr. Ewart.*) Is that the width of the pass?—No; 3 feet 8 inches pass. 3 feet 10 inches is the measurement of the machine. The width of the pass is 2 inches less than that; 3 feet 8 inches approximately. The projection of the splash guard in this case in its outward position, and of the brackets which support it is 8½ inches beyond the gable. That is, it stands 9¼ inches from the centre line of the spindles at each side on that frame. I cannot tell you what they are spinning for certain. I should not like to say, because I might be wrong in that, but in that room there is a considerable variation between that frame and the next. They are 5 feet or 4 feet 11 inches—roughly about 5 feet as an average distance, and they spin in that room 25's to 160's and the pitches run 2 inches and 2¾, and so on.

86. (*Chairman.*) Now presumably you have seen, I think it was in my report, when the last regulations were framed, and will have read that very considerable objection had been made by manufacturers (and it was said, supported by spinners) to the general use of splash guards?—Yes. Well, I questioned the workers at that particular frame I mentioned, and they said it was not inconvenient at all, and the women on the frame seemed to like them very much.

87. Have you given us the distance from frame to frame?—I gave you the distance from centre to centre—3 feet 10 inches.

88. The convenience or inconvenience would largely depend on the width of the alley?—Yes.

89. (*Professor Petavel.*) That is a very narrow alley?—Yes, that is the narrowest I have ever measured. I will give you the distance. It is 2 feet 3 inches in the gangway, roughly. I mean it might vary as you go up the frame, but that is just the measurement I made.

90. (*Chairman.*) You probably remember that by the regulations, there were two alternatives. One was that splash guards should be provided?—On 2¾-inch pitch and upwards.

91. Yes, and failing that, that the workers were to wear not only aprons, but bibs. I want to refer to the exact wording. "Efficient splash guards shall be " provided and maintained on all wet-spinning frames " of two and three-quarter inch pitch and over, and on " all other wet-spinning frames unless waterproof " skirts, and bibs of suitable material, are provided by " the occupier and worn by the workers." There was a good deal of discussion as to whether it should be absorbent material or indiarubber, and finally this "suitable material" was agreed upon by (I think) the Flax Spinners Association. Now, what is your experience in regard to the wearing of the bibs?—Well, I have questioned a large number of workers, and I have looked at them, and I think you might say, speaking generally, they will not wear a bib if they can possibly help it. They doubt the necessity for it also.

92. Of course I saw for myself, but I want to hear it from you?—Yes; they will not wear one.

93. Is this regulation observed, or is it not observed, as to wearing bibs?—It is not observed, on the ground, I should say, of discomfort alone.

94. Are you of opinion that the law should either be observed or that it should be altered?—My own view is that this regulation should be altered.

95. In what direction would you propose to alter it?—I would not alter it all at once, but I would propose it should be altered, or that full investigation be made to see if the inventive capacity in regard to splash guards has been completely exhausted. I think everybody—manufacturers and workers—would welcome an efficient splash guard, one that would not get too much in the way and would be really useful. Several attempts have been made recently, I think, and a new one is being tried in a mill at Belfast. I think that a compulsory splash guard after a certain time is really the solution of the difficulty.

96. You suggest the solution of the difficulty is what?—Ultimately an absolute requirement to use splash guards.

97. I do not say yea or nay to that, but assuming for the moment that such a regulation could not be carried out, what alternative would you suggest in regard to the wearing of clothing?—I would be inclined to leave them with their water-proof aprons.

98. But does not the upper portion, the chest, all get wet?—It gets partly wet undoubtedly, depending on the height of the worker. They do get a bit wet, but whether this is really harmful is a question for the doctors.

99. No, the question of getting wet is a question of fact?—But I was thinking of the result of the wet. They do become slightly wet.

100. The question of getting wet is, of course, a question of fact. The other question is probably a question for medical men. You cannot give a medical opinion, but from a common sense point of view do not you think these people coming out with wet clothing on on a winter day, with a cold east wind blowing, are likely to injure their health?—Undoubtedly it is likely to injure them.

101. Do not you think some precaution might be taken to make them wear something, say, in the works which could be taken off? They might take off their own blouse and put on another blouse for work, and then change again before going home; something to wear in the works to be taken off when they leave, when they could put on their dry clothing before going home?—I would not like to express an opinion upon that unless one could do it in practice, but I should like to see the result of a practical attempt in that direction. Of course, to admit of such a change, you introduce the cloak-room question at once, and the educating the people up to changing into such a garment and back into their own garments, so that when they come to the mill they could put on something and leave it off at the end of the day; but that is rather a big question. In the abstract it is ideal, I should say, if you could do it.

102. In mills that have been erected since a certain date cloak rooms have been provided?—I have only one spinning mill erected since the date named in the regulations, so far as I remember.

103. And that has a cloak room?—A cloak room has been provided there.

104. Are you able to say whether the workers use it?—They do use it, though I have myself recommended one or two little alterations in it, but it is an excellent cloak room, and it is used.

105. It has been suggested at different times that the objection to using a cloak room is that there is a rush for all the workers to get there; that they are pushing up against each other; there is a delay in hanging up their clothes, and consequently they object because they lose a portion of their meal time, or there is a loss of time in getting to their work. As a remedy it has been suggested to me that if you had an entrance to go in and an exit to come out it would help matters?—Yes, like a German system of cloak rooms and lavatories described, I think, some years ago in "Engineering."

106. So that if they could go in a queue and go straight in that delay would be avoided?—I think that delay is immaterial, considered with other delays. Take a girl. She leaves off spinning. The first thing she does is to wash her hands and her feet, or nearly always, or dry her hands and her feet. That takes some time. She does that in the mill. She takes up her stockings and boots and puts them on. I do not think the loss of time in going to the cloak room and coming out is any more than the loss of time they have in walking past each other or scrambling (using scrambling in a very wide sense) for their clothes at the end of the spinning frame. I do not think there is any material loss of time in going to the cloak room.

107. Going through the different mills, where do you find the clothing hanging up?—In most of the spinning mills they have provided boxes at the end of the stand. The girls will put their shawls in there, but if it is a very wet day they prefer to put them over the top of the trough, right over the creel.

108. Have you recently seen the mills at ——?—I have not been in the —— spinning mills at all. I have been in the weaving sheds there.

109. This is rather a leading question, but, as a matter of fact, I am only referring to what I have seen. Have you found the clothing of the workers frequently hanging on walls that are absolutely wet?—Well, not in spinning, because ——

110. Weaving?—Coming to weaving, I was going to tell you. There are a variety of things. There are boxes. Some factories have elaborate cloak rooms. Some, again, have all sorts of contrivances between one and the other, but I certainly have seen clothes hanging on the wall, though the worker does not, as a rule, put them on a wall that is wet. I recently asked a woman that very question in a spinning mill.

111. Have you read the regulation for clothing under the new Cotton Cloth Factories Regulations?—I cannot say I have read it closely. I have only glanced at it.

112. I will read you Regulation 10. (*Same read.*) Do you think that would be of any use in weaving sheds?—Yes, I have practically that in effect in some weaving sheds.

113. Referring to the Regulations for Flax Spinning, Regulation 11, I think there was a case in court?—There was.

114. Can you tell us exactly what the point was?—Well, the point was there was a weaving shed in which the only accommodation provided for the clothes was pegs round the walls, and if I remember correctly—I am subject to correction—roughly the decision was this. Having regard to the fact that the humidity was never as close, or might occasionally be as close, on the wet and dry bulbs as two degrees difference (the average, I think, was three degrees), and having regard also to the evidence from the defendant firm as to the unsuitability of boxes, the magistrates decided that the words "in which" were synonymous with "on which," and that pegs were suitable.

115. "In which to keep the clothing?"—I think "in which" pointed to the fact of something enclosed. The court held that was synonymous with "on which," having regard, I suppose, to custom and the evidence put forward by the defendants as to the unsuitability of boxes, and so on.

116. That is all outside the question of suitability?—I mean they decided the case on that.

117. The point is, "suitable and convenient accommodation in which to keep the clothing." That is the regulation, and the court decided that a peg on the wall was suitable and convenient accommodation?—In that particular case.

118. In which to keep the clothing?—Yes, in that particular shed. That was supported in the High Court.

119. It is desirable that that regulation should be made clearer?—Yes.

120. Or should be amended in some way?—I think so.

121. (*Mr. Ewart.*) Do you think the Cotton Cloth Regulation would be an improvement?—Yes, generally I think it would be an improvement. I should want to look at it very closely, but I said I think it is an improvement because I have examples in sheds which apparently follow that, from your reading of it; I mean they follow in line with it. I could give you one or two examples and you could judge for yourselves. I have no sketches. I have not prepared any drawings, but I could do so, or draw attention to where they could be got.

122. Has the difficulty come before you in any factory or mill where there is not sufficient length of wall to give a sufficient number of hooks?—Yes, there is a question of the length in one place. The thing suggested in two cases has been that there is not sufficient width in the pass to allow of any such hooks being put there, and in another case there was not sufficient length of wall to put boxes for everybody; they come to the same thing.

123. (*Chairman.*) Boxes are not required?—I have some boxes.

124. But they are not required by the regulation?—Not in the case of cotton; but when I say boxes, I have also come across a little cupboard on the wall.

125. I mean that is not what we are discussing at present. Mr. Ewart's question referred to the new Regulation for Cotton Weaving?—I understand there would not be sufficient length of room to put boxes in some cases, or pegs, or sufficient room to put a suitable covering.

126. "The difficulty of maintaining minimum "temperatures in some of the rooms where sufficient "exhaust has been provided." Will you explain what you mean by minimum temperature?—Have you finished with cloak rooms?

127. I do not think we can carry that any further?—There are examples, but I have no drawings to give you. If you wanted some I could supply some. The difficulty of maintaining minimum temperature. I think that was the point?

128. Yes?—There is some difficulty. In Belfast we get a good deal of up and down variation of the thermometer, and workmen come and complain sometimes that a certain sorting room is too cold on some days. I might find it very cold or sufficiently warmed, but there is a difficulty in the case of a roughing and sorting room which is not very large in capacity, and if the exhaust ventilation provided is sufficient to comply with the regulation it comes to this, that really the only way to heat that room is to put in a special apparatus and blow hot-air in. Generally it is heated by a circuit of steam pipes, and there is a real difficulty sometimes in providing sufficient heating to satisfy the regulation on cold winter days. I think it is too stringent.

129. What is the inlet ventilation in those rooms?—Occasionally the inlet ventilation is only through the upper parts of fairly high windows.

130. It seems to me the remedy is to have ventilators where the air has to pass over radiators?—But that is not sufficient.

131. But, why?—Because if you rely on the fans to draw in the air over the radiators you may regard the air as behaving like a piece of india-rubber. Your exhaust fan is pulling at this end, and you are baffling at that end, and it interferes with the draught. For instance, I apply the anemometer and measure, and it registers 500 feet a minute with the ventilators, doors and windows open. In the winter time there is a tendency to shut those windows and doors, and if you put the anemometer on then it will not show 200 feet exhaust; and this is below the limit in the Regulations.

132. Do they complain of the cold that comes through the apertures for drawing off the dust?—No, they complain of the cold in the room.

133. (*Mr. Ewart.*) The general cold?—The general cold.

134. (*Chairman.*) I do not see why there is a difficulty?—There is a real difficulty there.

135. I think the remedy seems to be instead of having full open windows to let the air come in through radiators?—Yes. It comes to this, that really there must be a plenum ventilation. We have that in some of the mills, but I mention it as a difficulty because it is very expensive to maintain the minimum temperature.

136. But in plenum ventilation the air is passed over some heater?—Yes, there must be a heater. I have that in some mills, but it is a big matter for roughing and sorting rooms. It is particularly a big matter for preparing rooms with a large area. In a preparing room, with a large area, and with the sort of exhaust that is illustrated here for the summer time or for ordinary times, the openings in the windows are sufficient to supply air, but when it comes to winter time the girls near the windows get all the cold air, and those in the middle do not get it.

137. It is a method of ventilation to be referred to ventilating engineers?—The ventilating engineers come to me to show them how to do it. That is the position in Belfast. I was going to give you an instance of that. Here is a preparing room (*producing photograph*) in which the ventilating engineers put in exhaust ventilation, and they put in one of these heaters in which the incoming air passes over steam pipes. That so interfered with the exhaust ventilation, by baffling the air, that instead of putting in one heater, as estimated by the engineers, four heaters were put in before the minimum temperature could be provided. Of course it has been overcome by some firms, but it is an expensive matter.

138. It ought not to be difficult to obtain a temperature of 50°, I should think?—No, not within one hour of starting in the morning; but I find a difficulty. The workpeople complain to me of the inadequate heating at times, and there is a real difficulty I think. It seems to me, if I might use slang, it is a hot regulation.

139. (*Professor Petavel.*) In which direction—the amount of air that has to be passed out?—No, the amount of air that has to be brought in to meet or balance the air exhausted.

140. Quite so. That is what I meant, of course, by air taken out?—There is a huge volume of air to be heated. The usual way of heating the air is to put the biggest and best baffle of steam pipes in the air current.

141. That interferes with the exhaust, of course?—Yes.

142. (*Chairman.*) That is an engineering question which I think Professor Petavel will consider?—I put that photograph in and possibly thought you might like to consider whether there is any necessity to alter the regulation in view of complaints or representations made to me.

143. (*Professor Petavel.*) Would you suggest a modification in that regulation to make less stringent or an increase of mechanical power to maintain the present standard? You can modify the temperature or the amount of ventilation?—Yes.

144. Which would you advise?—Generally, I would recommend reducing it five degrees Fahrenheit.

145. The temperature?—Yes.

146. (*Chairman.*) Would you have the workers working at 45°?—Yes.

147. (*Mr. Ewart.*) I would like to ask whether you have had any complaints from workers as to certain rooms being too hot?—Yes, I have complaints of the spinning rooms.

148. No roughing rooms?—Not in the winter, no. I have not had complaints of it being too hot that I can remember. I have heard a man mention "quite warm enough for me," but I have not heard a man complain of being too hot. It is quite conceivable.

149. (*Chairman.*) Now Regulation 4. (*Same read.*) What have you to say about that?—Generally it is complied with.

150. Do you think there is any advantage to be derived in sending thousands and thousands of reports to the Home Office to say that everything is correct?—Well, they used to come to us, but they do not come to me now. I have not had that trouble, but I have quite sufficient trouble with the few sent to me where there is, perhaps, 1° wrong in a whole month.

151. Have you noticed in the new Regulations for Cotton Weaving it is proposed that joint readings should be taken? In these, it is enacted that someone nominated by the operatives shall take joint readings with the person nominated by the manufacturer, and that in the event of anything being wrong it shall be entered in a diary and what is wrong shall be reported to the inspector, on the grounds that it is unnecessary to keep sending thousands and thousands of entries indicating that everything is all right. Do you think such a regulation would be desirable for the flax as well as the cotton trade?—Well, I would not quite like to express an opinion on that, because that is trenching on the internal discipline of the mill, and I hardly think it would suit Ireland. For my part in enforcing a regulation I would rather deal with one party than two.

152. Will you turn to the Report on Cotton Weaving?—I have not a copy of that report. I do not think I ought to express an opinion upon it. I would rather see a self-recording instrument which

you could back up. I think everybody would be satisfied.

153. (*Professor Petavel.*) What is your opinion as to the accuracy of the readings sent in?

154. (*Chairman.*) That is the point I am coming to. What I want to know is, can you remember the number of reports that are sent in?—It is enormous. They run into millions, I believe. They are dealt with by a clerk.

155. There are several departmental clerks simply registering "everything is right," "everything is right"?—Yes. If it could be got rid of I quite agree. A reading once a week or two or three times a week might get over the difficulty, but if the hygrometer is necessary I would not like to express an opinion on this joint reading arrangement and reporting to the inspector. I think you would get almost as much irregularity as you do now. I mean irregularity as to readings, in proportion.

156. I will read you the report on this point. (*The Chairman read from page 15 of the Second Report of the Humidity Committee, the paragraph headed* "Humidity Records.")?—In Ireland you only get half as many, but I have still firms who have two in each room.

157. The point I want to get from you is, do you think there is any good to be derived from simply sending in a lot of reports saying everything is right?—No, I do not.

158. Would you suggest some modification in the system of reporting?—Well, if an automatic machine could be devised, if a reliable one could be got, I think that might be sufficient, and the records simply kept at the office open to inspection.

159. Would you advise having a self-recording instrument in each room?—Yes, in each room if a machine could be simply devised for the purpose.

160. Of course there are recording instruments, but these take a lot of skilful handling and manipulation?—I think in the absence of a simple recording instrument you might waive the readings being periodically taken, but it is no good taking an automatic machine into a room just to look at it like a thermometer. You must leave it there for some time. Or one could do this, have a regulation like that for cotton-spinning mills, where there is humid spinning. A table of humidity is prescribed and the hygrometer is affixed, but no record is taken. The same plan is adopted in some mills here. Under the Flax Regulations if they give me notice that they intend to maintain four degrees difference there is no record of humidity to be entered up.

161. They are exempted?—Yes. One might waive the records and leave the hygrometer there.

162. What check would you have? What check would you propose?—The only check is by inspecting from time to time.

163. The visit of the inspector is perhaps once a year?—Yes.

164. Would you propose any check beyond that?—Well, if there is no confidence in the workers you come to the same thing.

165. It is provided in the Regulations for Cotton Cloth Factories?—Yes, dual inspection.

166. And somebody has to sign that he has actually seen it. If you get two people to sign their name week by week to something they have not done?—If you prescribe a form of register, and say the mill manager has to sign in it once a week, I think that is quite sufficient.

167. That is what I am proposing?—I would not like to express too definite an opinion, because you are interfering with the internal discipline of the mill. You read me a rule providing for a dual signing of the record. I would not like to go as far as that.

168. You are not prepared to recommend a dual record?—It is a point I have not considered, and I would not like to express an opinion on it, because it goes down in black and white. I would not like to go that far without making inquiry.

169. Quite so. Will you consider this question and let us have your views at a later date?—I will, yes. I will do the best I can with it, but I feel a little sceptical about it.

170. I am afraid we are all nervous about these questions, but we have to come to some conclusion?—Of course that system is entirely subversive of the whole principle of factory legislation. It is a very big question. That regulation is practically the introduction of the checkweighing from a colliery into a factory.

171. Have you read the Report of the recent Committee on Cotton Cloth Factories?—Yes, the principle was introduced in the Potteries.

172. In which they say they strongly recommend what is called self-inspection?—Yes.

173. And strongly recommend that greater responsibility should be placed on the manufacturers, and that the manufacturers should accept responsibility for the internal economy of their own mills and not the inspector?—I would not put much reliance in that Pottery regulation as it stands. I much prefer the Flax Regulation as it stands at the present time. There may be reasons in the Potteries, but as regards Belfast, and after my experience in other districts, I would not have it for an instant. I would much rather rely on my dealings with the manufacturer. That is my feeling at present.

174. I am afraid you are not supported by the Committee on Potteries or the Committee on Cotton Cloth Factories, but of course you are entitled to your opinion?—Yes, that is an opinion. Of course hearing evidence you have good reasons for coming to certain conclusions, but you ask me as a factory inspector.

175. Regulation 7. Can you suggest anything beyond what is done to prevent the escape of steam from the spinning troughs?—The very latest, I believe, is recognising the fact that certain steam escapes, and exhausting it. I do not know what the experience in working it would be. It is running in one mill as a practical thing, and it is being applied experimentally in another mill, but they do not quite like it in the latter mill. We have given attention to that regulation and recommendations have been made. In fact there was one prosecution for steam coming from the troughs.

The witness withdrew.

Mr. W—— M—— called and examined.

176. (*Chairman.*) What position do you hold?—Power loom tentor.

177. In what mill?———

178. What goods do they manufacture?—Fine cambrics.

179. How long have you been employed in a weaving shed?—Between 20 and 30 years.

180. And in all that time have you been employed in what is called a humid shed?—Yes.

181. Have you always worked on fine goods?—In some of the sheds I have been working in we had coarse goods as well.

182. Side by side?—Side by side.

183. And I suppose the temperature of the sheds varies very considerably according to the time of the year?—It does undoubtedly.

184. What time of the year do you have the best weaving?—Well, we get the best weaving in what we call the summer time. In the winter time or in the cold weather we have not as good weaving as in the warmer time.

185. Can you tell us approximately the average readings in the winter and in the summer of the wet and the dry bulbs?—I have not any notes, but I could furnish you with that. I think I have some of the sheets with me, but they are last year's, I think—June, July, August and some of September if they would be of any use.

186. Could you get those?—Certainly. (*Same produced.*) I suppose I had better take June first, then July and August. We have three weaving sheds. This is June 1911. Do you want any particular date?

187. What is the date you have there?—This is June 1911.

188. Take the highest temperature in June 1911?—81½° wet bulb, and 84° dry. I think those are about the highest.

189. Eighty-four degrees?—Yes.

190. Is that for a whole month?—That is the whole month.

191. On how many days during that month did the wet bulb go above 75°?—Nine days.

192. At what time of the day is the hottest time?—The afternoon. I always feel hotter in the afternoon.

193. From what time to what time?—I think the sheets show the afternoon is the hottest. I am not quite sure about that.

194. Can you say from what time to what time is the hottest in the afternoon?—From about half-past 2 to 4 o'clock.

195. Now that is June. Have you July?—Yes.

196. Of course, we have this before us, but I just wanted a sort of general idea. Now this is in the month of June 1911. That is No. 3 shed. What shed is this (*indicating*)?—No. 1.

197. Now for the month of July. I see there are two occasions during the month in the afternoon when it was below 75°, and the highest record in that month is 86° wet bulb. These are typical, I think?

(*Professor Petavel.*) Yes.

198. (*Chairman.*) This is No. 1 shed, and it is for the month of September, and we find on eight days the wet bulb temperature exceeded 75° in the afternoon. When the wet bulb temperature exceeds 75°, how is the comfort of the workers affected?—Well, when the wet bulb exceeds 75°, or about 75°, somehow I feel a slight discomfort. I could hardly just describe it to you. I cannot find words to describe the feeling.

199. But it produced, you say, a feeling of discomfort?—Well, I have often found slight discomfort.

200. Have you been able to form any opinion as to whether, in addition to discomfort, the health of the workers suffers in any way?—Before we go away from that point I may say that there are times when I have noticed the wet bulb above 75°, and I have not felt any discomfort. I believe if the day was fairly dry outside, if it is what you call a dry day, I have never found the same discomfort, that I can remember, that I have when the outer air was humid and damp.

201. Well, I take it your evidence is to the effect that sometimes it produces discomfort and sometimes it does not?—Sometimes it does and sometimes it does not. That is my experience.

202. Can you, from constantly being among the workers and seeing them, give any opinion as to whether they suffer inconvenience or that they suffer in health when working in the high temperatures?—Take myself personally. I think I am fairly healthy at the present time.

203. Do you spend the whole of your time in the shed like a weaver?—Well, I do not exactly spend all my time in the shed.

204. To go back to the question I put to you, have you formed any opinion as to whether at these high temperatures the health of the weavers suffers?—No, I have not formed any opinion.

205. Probably a difficult thing to do. Now, from a weaving point of view, supposing you had to arrange it, what number of degrees between the wet and the dry bulb thermometers would you like to have for efficient weaving?—Well, as a general, I would like to have two degrees of difference. Not always, but with some exceptions, I have found that has worked out very well.

206. Two degrees?—The wet bulb two degrees below the dry.

207. Do you find that the same in the winter and in summer?—Well, at the lower temperatures, sometimes, we could do with a degree more, and then we would have better weaving conditions when the wet bulb reads within one degree of the dry.

208. At low temperatures in winter?—Yes, especially in the months of February and March.

209. You would like to approach to one degree?—Yes, to get really good working conditions in the weaving shed. I should like sometimes to be able to run the wet bulb within one degree of the dry. It would be necessary to do it.

210. Have you any experience of weaving coarser material than cambrics?—Yes, coarse boiled linen.

211. What difference between the bulbs do you think necessary there?—Well, I never gave that much thought, because it is not a matter of much moment.

212. Would it have been possible to stop artificial humidity at any particular point with that class of work?—All I can say is that it could be woven with very little artificial humidity.

213. Would you like to make any statement to the Committee?

214. (*Mr. Ewart.*) Before we leave the point, what is meant by coarse sets or coarse linen?—5^{00} to 6^{00} boiled yarn linen.

215. I presume that is not a common practice with you?—No, that is a number of years ago when I worked in another weaving shed.

216. (*Chairman.*) Do you hand in this paper relating to your meeting at Portadown?—Yes.

217. We hope that the gentlemen present at that meeting will help us to discriminate between the weaving conditions for fine cambrics and those for coarser fabrics?—Might I be able to help you just now?

218. Yes, by all means do?—The coarser fabrics referred to here are the strong linen, say from 6^{00} up to 12^{00} and they are, as a general rule, coarser and stronger than cambric yarn is. Cambric yarn is a great deal lighter, and is used more for handkerchiefs. The coarser stronger linens are used for other purposes, for pillow cases, sheets, and table cloths. Some of it is used for table cloths, but it is usually damask.

219. What about shirtings?—No, I cannot include that. It might be included, but I am not aware of whether it is or not. I cannot say. Most of the light cambric is used for pocket handkerchiefs, and some of it is used for ladies' dress materials. It is a light flimsy material. Sometimes you could read through two ply of the kind of thing I mean. The weather outside—that is the humidity outside the factory—affects it far more than it does coarse stuff, and if we were put on the same regulations as the coarser material I think it would be a great mistake.

220. Have you any further statement you would like to make to the Committee?—Not unless someone makes a suggestion that would bring something to my mind.

221. (*Professor Lorrain Smith.*) How do you fix on 70°?—Well, that has been my experience, that about 70° is the best weaving conditions. We fix that from experience.

222. But you get 70° in winter, do you not?—Well, we can heat it up to 70°, and we find that would give us the best weaving conditions.

223. And if you go above 70° do they begin to get worse?—In the dry bulb?

224. This is 70° in the wet bulb, is it not?—No, 70° in the dry.

225. What would the wet bulb be?—Two degrees below that. Those are the best weaving conditions. That gives us the ideal weaving condition.

226. Then either above or below is not so good?—A degree above or below would not be appreciable.

227. But five or more degrees below?—Five degrees below we would begin to feel it.

228. Five degrees above would you feel it?—Not as much. It would be hot.

229. Even though you have only two degrees of difference?—Yes. There are times even with the dry bulb at 70°, 72°, and 73° when we could do with a little more than what we are allowed under the regulations at the present time. We will say, for instance, that the dry bulb was reading 75°. Well, there are times when to make the ideal working conditions for fine cambric, it would be necessary to work the wet bulb up to within a degree and a half of the dry.

230. That is with the east winds, the dry winds?—The north-east wind is very bad; but there is some-

thing else and I cannot explain what it is. I believe there is something else which does more harm even than the wind—a state of atmosphere I find sometimes and it is very bad It seems to eat up all the moisture we can put into the shop.

231 Do these days come at any time?—They come occasionally

232. Any time during the year?—They may come at any time during the year, but generally when there is a dry wind, especially the north-east wind. When these times come I very soon know because some weavers come to me and imagine all sorts of things are wrong at the loom, and once there comes a change of weather again and the atmosphere outside becomes humid, the loom is all right.

233. Then your evidence would be that if you could keep the temperature at the ideal point you would keep it at 70°, not either above or below?—Not very much above or below; a degree or so does not count.

234. (*Professor Petavel.*) I should like to ask, what is your general impression of the conditions of weaving during last summer? Last summer was very warm: your sheds were very warm Did you have a great many complaints?—I did not hear many complaints. They have complained to other people, but they did not complain to me. We did not use any more humidity than at any other time, and we never do, only with the exception of half-an-hour or so when I might have been making a little bit of experiment. I might have let it run up a little bit

235. Did you have any cases of weavers having to give up work on very hot afternoons?—I do not remember any of the weavers having to give up work last summer any more than any other summer There are times when weavers will have to give up work. I suppose, being human, we are not always just in the same kind of health, but I do not remember any of the weavers having to give up work on account of the heat any more than any other summer—not as far as I can remember. A weaver may take sick any time. They do in the winter time.

236 (*Professor Lorrain Smith.*) Just as much?—Well, I do not think so, not so much I think as in the hot weather.

237. (*Chairman.*) Just one more question. You have seen that in the Cotton Cloth Regulations the introduction of artificial humidity is prohibited when the wet bulb gets to 75°?—Yes, I think I have.

238. At any rate you understand what I mean?—They have to stop using artificial humidity when the wet bulb reaches 75°?

239. Yes, that is so Do you think for the particular class of goods that you manufacture any limit could be placed, and if so, what limit?—My opinion is that if the regulations for our fine weaving were just allowed to remain as they are it would be the best.

240 That is two degrees difference at any temperature?—Yes. Well, we could take a little more sometimes.

241. (*Professor Lorrain Smith.*) You have no experience of cotton weaving?—I have worked some cotton but I have had very little experience of it.

242. (*Chairman.*) I should like to ask you whether this meeting was suggested by the operatives themselves, or was it proposed by the employers?—This meeting that is going to be held on Monday night?

243. Yes?—I may tell you that the weavers approached me first of all, and then I introduced the thing to the foreman, George Bell, and we arranged to have a meeting, and I went so far as to ask the place where we would hold the meeting. We believe that any reduction in artificial humidity would hinder our fine cambric trade. Well, it may. Of course I am not an authority It may help the worker in one way, but I believe the cure would be worse than the disease, because if we were not allowed sufficient humidity in the fine cambric weaving the result of it would be that our workers would have to work a great deal harder and their earnings would be considerably less than they are If that were done, at the end of the year we should be in a worse position than what we are.

244. You would have to work harder on account of more piecing?—Yes

245. Are you going to send us a report of this meeting?—Most decidedly. We shall have a reporter there. We will send you the Press report.

246. (*Professor Petavel.*) Do you think any chemical treatment of the yarn would diminish the quantity of moisture required?—That is a thing I have not gone into.

247. You have no information about it?—No.

The witness withdrew.

Miss MARY GALWAY called in and examined.

248 (*Chairman.*) I think you are the general secretary to the Textile Operatives Society of Ireland?—Yes.

249. Does that comprehend the whole of Ireland?—Well, it would if we had it thoroughly organised; it would take in the whole of Ireland, but unfortunately there is only a portion organised.

250. Can you tell us roughly what proportion?—Well, we have a branch in Drogheda and one in Newry, but the greater portion of our members are in Belfast.

251. You mentioned the textile operatives, are those the female operatives, or have you men operatives as well?—It includes men and women in the linen trade. That is the Union belonging to the Branch they work at, the men in the spinning rooms and men who have no trade union.

252. Then you have men members as well as female members?—Yes

253 I suppose the majority of them are spinners or weavers?—Yes.

254. Have you personally had experience of working in mills or factories?—No, not in working; just the reports from the members.

255. You have never had any experience of working in any capacity or overlooking?—No, not in any mill or factory. In the warehouse I worked.

256. Then how long have you held your present position?—Sixteen years secretary altogether; 14 years permanent secretary, and two years temporary.

257. And you probably have had many conversations with individuals in regard to the effect on the health of the workers?—Yes You see, the girls when they feel that there is too much heat, or too much draught, or too much water come and complain to us, to report to the inspector and have it made right if possible—when they consider the steam is too great in the places where they work

258. You know probably that this Committee is appointed to consider certain things, and our principal point is the effect on the health and comfort of the workers in humid factories, the idea, of course, being that at certain high temperatures the health begins to suffer, and the people undergo bodily discomfort. There are many other questions doubtless in connection with flax spinning and weaving, but those are not what we are to inquire into?—Just the heat?

259. And the moisture?—The humidity?

260 Yes. I think we will begin with the spinning rooms. Have you anything to say in regard to the health of the workers in spinning rooms?—Well, they very often complain to us of the excess of heat and bad ventilation. Sometimes they complain there is no ventilation and the windows are never opened unless some of the employers think the factory inspector is about, and immediately he disappears the windows are closed up again; and the heat is terrific in some of the places; you can tell by the colour of the girls coming out

261. They complain about the heat?—Yes, the awful heat. Of course, they are bound to have heat in order to spin flax, I know, but there is an excess in a good many cases. The constitutions of the workers are not fit to stand it.

262. What about the moisture?—They call the steam the moisture. They just describe it as heat. They feel the discomfort of the overheating They

mean by that the steam that is used in the manufacture of the yarn When they say heat, it means the humidity.

263 You see there are a good many sources of moisture. For instance, your mentioning the steam, that is used for the water in the troughs. Then another source of moisture is the spray from the flyers, and the floors are often wet. Have you anything to say with regard to those points?—Just the usual complaints that I forwarded you a list of. I just give you the words that the workers themselves use in making the complaint to us. The local factory inspector investigated the complaint, and she will be able to tell you the condition of things she found. Of course, I cannot investigate; I have not power to do so.

264. Have you been in many spinning rooms?—Just through two or three, seeing them, walking round. I should not like to work there. A walk round would be enough for me.

265. I rather wanted to discriminate between the damp and the heat, because you might have a great deal of heat which would be a dry heat and people can stand a great deal of dry heat when they cannot stand as much wet heat. But have you anything to say about the condition of the floors or the amount of moisture?—Our members often complain of the wetness of the floors and the water injuring their feet. Of course there are places where the floors are nice and dry, but there are frequent complaints about the slipperiness and the general wetness of the floors.

266. (*Professor Lorrain Smith.*) You say it injures the feet?—Yes, the workers say there is something put in the water. I cannot tell myself what it is, neither do they know, but they say there is something in the water that takes the skin off the feet. They have shown me in between their toes many a time where they are red and sore with standing in this water all day with bare feet.

267. (*Chairman.*) You are talking of the spinning rooms?—Yes, the floors are always wet.

268. (*Professor Lorrain Smith.*) Is that common amongst spinners?—Well a great many of them do complain. I cannot say in how many places.

269. A great many do stand on the damp floors?—They stand on the wet floor all day.

270. Is it a large proportion of them that complain of these sore feet?—They are continually complaining about it, but we do not take down all the complaints they make. If we did it would be a weekly affair, but we ask an inspector now and again to call and see if anything can be done. He cannot be plaguing them all the time about the same thing.

271. (*Chairman.*) They work in bare feet in the spinning rooms?—Yes.

272. Have you ever considered whether it is desirable to wear clogs?—I really do not know. That is a matter for themselves. They may find it uncomfortable to wear clogs.

273. (*Mr. Ewart.*) There is a great prejudice against clogs?—Yes. Would it be possible to wear them running about?

274. There is a prejudice. There is one point. You say when they complain about these wet floors you sometimes ask the inspector to look into it?—Yes.

275. What inspector?—Well, usually Miss Martindale. She will have her reports, of course, on the condition of things as she found them.

276. (*Chairman.*) Still speaking of the spinning rooms, what about the state of the clothing of the workers in the spinning rooms?—The cloak-room accommodation? Do you mean the clothes they wear all the time?

277. Yes?—They are filthy. Of course the rooms are very dirty.

278. Are they wet?—Well, they look to me to be wet—oily and wet, and very dirty at the end of the week. In a couple of days they would be dirty.

279. From what source do the clothes get wet?—From the water that comes off the flax.

280. The spray from the flyers?—Yes.

281. There is a law that the workers are to wear some waterproof aprons?—Yes.

282. And suitable bibs?—Yes.

283. To keep the water from wetting their chests, and so on. Are you able to say if that law is observed?—In some places they have very nice ones, but in many cases when those are done they are not supplied with new ones. In all these cases I always tell the inspector. In one place there is a sort of lady nurse, and she told some of our members that glaziers were not necessary. We call them glaziers.

284. The law requires they shall be protected, not simply below the waist but above the waist, the idea being that if they get their clothes wet and go out into a cold east wind, or in the winter time, they may get chills and so on, but as a matter of fact we do not find them wearing any protection whatever for the chest. Even when supplied they turn it down and do not wear it. Now, it is not much good trying to do things for people if they do nothing for themselves. Can you tell us why they do not wear them?—I cannot see what objection they could have, seeing that it keeps their clothes dry. I should think it is to their advantage to wear them. We have never been complained to that they do not wear them. On the other hand, some of our members complain that when they are worn out they are not supplied with new ones.

285. Of course, I cannot give evidence, but several of us have been round and we see that they do not wear them. Now I ask you, as being in a position to inquire and to hear complaints at various times, why they do not comply with the protection that the law gives them?—I never heard complaints that they did not. I really do not know. If I had, I should advise them for their own sake, for the sake of their health and cleanliness of their clothes, to wear them.

286. Have you anything to say in regard to the cloak rooms or the places for hanging up the clothes?—Yes, I think the provision to provide cloak rooms to keep the clothes from getting damp is a very good provision, provided the cloak room is easy of access, but they have a short meal hour, and the rush at the meal hour is awful at the cloak room. I worked in a large place where we had to go to the cloak room for our clothes at the dinner hour, and everybody grabbed at the clothes, and one's hat and jacket were knocked down and walked on, and you had to rush out through the crowd that was coming in.

287. The spinning rooms are one above the other?—Yes.

288. And it would probably be very difficult to provide space outside each spinning room for a cloak room. Is not that so?—Yes, it would be difficult. If it could be some place near to the workroom where a girl could get her clothes without such a rush it would be better.

289. That is what I want your opinion on, because some people say there ought to be cloak rooms, and this, that, and the other, and we want to realise the position. Supposing you have one, two, three or four storeys, one above the other, in the mills as they are now constructed, I take it there is no place for a cloak room outside each spinning room?—No, I do not think there is.

290. Then you will have to come to the bottom, and each worker will have to go all the way from the top to the bottom to get into the cloak room?—Well, there is such a rush.

291. There would be such a rush, and would a cloak room under such conditions as that be a convenience to the workers?—I do not think it would. It would be inconvenient in a short meal hour. There is only three-quarters of an hour to gather up their clothes and get home to dinner and get back.

292. I have heard so many times before, but I want to have your opinion. Seeing that there are in instances difficulties against the cloak room, what would you suggest as some suitable means of hanging up the clothes of the workers?—I was making some inquiries the other evening about splash boards, and one girl ——

293. We will come to splash boards after?—This was about the cloak room. She told me in a talk with her they have a cloak room at the end of the spinning room, and it is kept beautifully clean—washed out

twice a week and disinfected; the employer pays the girl and they pay a work girl a shilling a week, and she brings all the clothes out and leaves them on a table at the end of the room so that each worker as she leaves work can pick up her clothes and walk out without any rush. That is the best idea I have heard yet

294. That is a spinning room where?—At ——?

295. They have one on each floor?—In the room this girl worked in that was the arrangement. I cannot say if they have one in every room, but at this place the table was at the end of the room, and they paid a worker a shilling a week to bring clothes out before they finished work, and each one picked her clothes out from the table that was provided for the purpose of putting the things on. I thought it was a convenient way and allowed the workers to get home early for their meals.

296. Supposing you cannot have these cloak rooms in all cases, as you said just now, can you suggest any means for hanging up the clothes to keep them fairly dry other than in cloak rooms?—I could not, not in a room where there must be a certain amount of humidity. I could not see how they could be kept dry unless there was a cupboard against the wall where each girl could leave her clothes.

297. Have you ever felt the walls in these places?—I have not The water runs down them. I have heard that complaint

298. Supposing the water did run down, do you think it would make it better for hanging up the clothes if you had some wooden matchboarding and something to prevent the water falling on the clothing?—Of course it would; and at the present time a great many do hang their shawls on the walls, and the water gets on the shawls.

299 Now we come to splash guards. You know, perhaps, that this question has been from time to time discussed in Belfast?—Yes.

300. And do you know that in various official reports published it has been said that so strong was the objection of the spinners to splash guards in some instances that they threatened to strike rather than use them?—They have a great objection They say they are awfully in the way when they stop their flyers, and they are awkward to use. They all seem awkward to work with. I asked them could they not try and get used to them, seeing they kept their clothes and the floor dry, and would be much more comfortable to work with, but they seemed to think them very very awkward and much in their way, especially where the spinning frames are close together. Stout women complain that they knock themselves against the brackets that are put up for these splash boards. They knock against them; there is not room enough. That is in the places where the spinning frames are fairly close; but they seem to think they do not keep the water from falling on to the floor. They have to wear the glazers all the same in addition to having the splash board.

301 I see you say here: "Splash boards of a "modern type would prevent all this, but they must "be modern and not the cumbersome contrivances in "use in some of our mills." Have you seen any modern type of splash board?—I saw two models, but not being a spinner I could not say whether they would keep the water from falling on the spinners. Of course, it does not matter what type it is they will have to work at it It is not my opinion I have had long conversations with them, hoping that they could become accustomed to them in order to keep themselves more comfortable; but they seem to think they are very very awkward unless there could be something invented less in their way Perhaps Mr Ewart could give some idea of the newer patterns.

302. (*Mr. Ewart.*) I do not think there is anything invented yet that is not prejudiced?—You think it is only prejudice?

303. In some cases?—You think they could become accustomed to them so that they could work all right at them if they tried to. Some of the inspectors have told me that in some of the places they go into where they are in use the floors are beautifully dry. Of course, that made me think if the girls tried to become accustomed to them they could also use them here, in all the wet-spinning and coarser rooms.

304. (*Chairman.*) I see you advocate the provision of seats for weavers?—Yes. I think that is very necessary.

305. How many looms does each weaver watch?—Two, and sometimes three Some of them have three; most of them have two.

306. Then with the exception of piecing what have they to do?—They have to watch the machinery; to keep the cloth perfect, to keep it free from slubs and catches It keeps them busy. They would not sit much

307. Could they do their work and occasionally sit down?—If the work was right they might take a few minutes, and it would be a great help to girls who are not very strong, and better than standing 10 hours a day. It would be better if seats could be provided. I think Lady Ewart was the means of having seats provided.

308. One is very glad to hear it has been tried, and perhaps we shall hear more about that; but of course I cannot say whether the work can be done and seats used at the same time It would seem desirable if it is possible?—If the yarn was fairly good I say that they could take a few minutes now and then, and it would be a great help to a weaver who is having to stand in places where the heat must be between 80° and 90°. They surely want a little bit of rest; and if it was possible to give them that, would not it improve a girl in every way, and assist them to do their work better, if they had a little rest? I should not like to be compelled to stand 10 hours a day

309 I see you recommend something that I was suggesting this morning, that is in the cloak rooms—that there should be a door at each end so that they can pass right through?—Yes.

310. Do you think that would prevent the rush and the loss of time?—It would prevent the awful crush I myself had for a little while in one place. It was terrific. You got your clothes trampled upon.

311. You simply go like a queue at a theatre?—Yes, pass through and lift your clothes down and walk out, and the others do likewise. That is if it is possible to provide a cloak room of that type. (*The Chairman read over the list of complaints supplied by the witness.*)

312. You say in certain instances they are not supplied with new glaziers or waterproofs when the old ones are worn out?—No

313. (*Professor Petavel.*) Could you give us the principal headings of the different things you have had frequent complaints about?—From the fine weaving shops we have the complaint of the heat almost every week, although, as I say, we do not plague the inspector about going over every week; but with regard to the excess of steam and the discomfort they feel in working and the dampness of the floor on account of the condensed steam, that is a frequent complaint in all shops; not confined to any one place; it is a general complaint.

314. In summer and winter that same complaint comes in?—It is worse in summer, but they complain of it in the winter as well.

315. Did you have a larger number of complaints last summer, for instance, than this summer?—Yes, on account of the hot summer, there were more complaints; but there are a lot of complaints in the winter time about the same thing

316. (*Professor Lorrain Smith.*) Have there been many this summer?—I could not say the exact number.

317. It has been a cold summer?—Yes, it has been cooler.

318. Has that made a difference or not?—There has not been so many this summer; but we have complaints about the humidity in the winter as well, and it is worse on them in the winter because coming out of the heat into the cold air at night they are more likely to catch chills

319. (*Chairman.*) There are a great many complaints about the condensed water falling on clothing and making it wet. That is the weaving sheds?—Yes, it falls from the roof. The steam gets on the roof and

drops down on to their blouses and clothes, and wets them through. Sometimes they have shown me their clothes; and I have seen them coming out of the fine factories, and their things were all wet.

320. On account of the condensation? — The humidity in the place.

321. There are reports here that the members employed in the above factory complain that condensed steam kept continually falling on them and wetting their clothes. One member stated she had taken a pain in one of her lungs on account of the damp clothes?—Yes. That is a very fine place. That one was off six or seven weeks with a pain in her lungs. She attributed it to the water falling from the roof on her clothes where she stood at the looms.

322. (*Professor Lorrain Smith.*) What time of the year was that?—I think that is down.

323. (*Chairman.*) March 2nd. Here is an interesting one: "Spinners employed in small room where "there are only three spinning frames complain that "the floor is always flooded with water, and there is "no drain or vent to let the water away." That is what we were talking about this morning?—That was a very small room. There were only three frames in it, and I complained to the factory inspector, and I think since then the workers reported to me that they have been put into a big room and the drains made right.

324. Here, again, is an instance of what I was asking you about: "The weavers complain that the "walls of the weaving shed where the girls hang their "clothes is very damp."—Yes.

325. "The water runs down the walls and wets them." That is also what I was asking?—Yes.

(*The Chairman read a number of other complaints.*)

(*Witness.*) Some of the ventilators seem to be kept not working very often. I do not know why.

326. Then again, with regard to putting the shawls in boxes?—If you go to the work-room on a wet morning you see the girls come in with wet shawls, and they roll it up and put it in a box, and the water goes right through the shawl. I had to do that for many years, and if I got my jacket wet I had to put it in a box, and the wet goes right through the jacket.

327. "The weavers complain that the shop is so "terribly warm after the gas is lit that they catch "colds coming out into the air. They are of opinion "a fan should be kept working and the steam turned "off after the gas is lit, in order to counteract the "heat." We have had witnesses here this afternoon who are all against turning the steam off; they say they cannot work with it turned off?—Of course, some of them do complain that the yarn will not weave without the steam.

328. (*Professor Lorrain Smith.*) It has been represented to us that a little more steam would be an advantage and that the weavers would welcome it?—I wish they were talking for some of our members. In a factory a few years ago a girl fainted with the heat, and another one got up and opened the window, and because she dared to open the window they dismissed the one that fainted and the one that opened the window. That is a fine factory not far from Belfast. There were no windows open and no ventilators at the time at all. It was an old factory, of course. Things are put right since.

329. (*Chairman.*) Is there anything else you would like to say?—I would really like to try, if it were possible, to get some seats, where it would be possible for them to have seats. I consider it very hard for some delicate girls to stand all day. If they could have only a few minutes to sit it would be a humane thing to let them have a seat. There is a big death-rate from consumption. I would like to do anything I could, and I am sure this Committee are anxious, too, to improve the health of the workers.

330. (*Professor Petavel.*) Do you consider the health of the weavers is less good than that of the rest of the population?—Well, I have no figures to show. I could not say, but I know we have a great many young people very delicate. Many of them are unfit to work, although they are obliged to do so.

331. What percentage of the weavers does your society take in, say, in Belfast; can you give us any idea?—I cannot say the numbers employed, but perhaps Mr. Ewart would assist us. I do not know even roughly the number of weavers employed, but we have about a thousand I would say—1,500 weavers and winders, that is the factory hands.

332. (*Chairman.*) In your society?—Yes.

333. (*Professor Petavel.*) That is in Belfast, is it, or in all three cities?—In Belfast. In our society in the Newry Branch we have about 500, and 500 in Drogheda, weavers and winders. They are the factory workers.

(*Mr. Cummins.*) Talking of seats, I am afraid it would be impossible for a weaver to sit as the stuff is so brittle. You could not sit and watch it.

334. (*Professor Petavel.*) If there was any time to spare they would run an extra loom, as they do in Lancashire, and earn more money?—Well, I say where a yarn might be fairly good they might have a few minutes, but I say again, with the sort of yarn we have at present, if it is very bad material, as Mr. Cummins says, it would be impossible to sit and make their cloth as they must make it.

335. (*Mr. Cummins.*) I have seen them try to sit a few minutes, but they lost from about half-an-hour to three-quarters?—Righting what went wrong?

336. Yes, righting what went wrong?—Of course, Mr. Cummins is a practical man. He has woven in the factories all his life, and knows better than I do. I am speaking from the reports given me by our girls. The men do not trouble us much, but the women do complain about the long standing; and if it is possible to do anything, I should like to.

337. Of course they may be able to sit a little in the coarse shops?—Yes, and there is a great deal of coarse work done here.

338. (*Professor Petavel.*) Have you any general opinion as to the reduction of the amount of steaming? Reduction of steaming usually means more comfort but more work; because we are told that the weaving is less easy with less steam?—Yes.

339. What attitude do the members of your association take with regard to that? Would they rather have less steam and more work, or more steam and less work?—I do not know. I think they would like the steam reduced. I do not know whether they would if it means they do more work and get less wages.

340. But are they willing to face that?——

341. (*Professor Lorrain Smith.*) The people who work on cotton said they would lose a considerable amount of wages rather than have the steam going on. You do not know what attitude your people would take?—Well, sometimes they do say when the shops are cold the yarn breaks, so that they cannot get on with their work. They have said that as well.

342. (*Chairman.*) They are piece-workers, I presume?—They are all piece-workers.

343. (*Mr. Cummins.*) My experience is that the best heat is from 60° to 65°, and once it goes to 75° you are much worse off?—It does not weave so well, do you mean?

344. No, it does not weave so well when the steam goes over 75°?—Sometimes it is 80° and 85°, and our girls complain to me that sometimes it is up to 90° in some of the fine places.

(*Professor Petavel.*) Do you mean the temperature, or the percentage of moisture?

(*Mr. Cummins.*) Moisture.

345. (*Chairman.*) The percentage of humidity?—Yes.

(*Professor Lorrain Smith.*) What does this 75° mean—the reading of the wet bulb thermometer?

346. (*Mr. Cummins.*) Yes?—If that is so it prevents them getting on with their work, you said. Is that your experience, Mr. Cummins?

347. (*Mr. Cummins.*) I beg your pardon?—Over 75° the work is not so easily done.

(*Mr Cummins.*) No, once it get over 75° there is too much moisture

348. (*Professor Lorrain Smith.*) It is fluffy? You like two degrees apart wherever you are?—Yes.

349. (*Professor Petavel.*) It would not do with three degrees?—No.

(*Chairman.*) Is there anything further you would like to tell us?

350 (*Professor Lorrain Smith.*) You have never come across any weaver who really asked for more steam?—No, they all want less

351. (*Chairman.*) But not less money?—Not less money? Oh, bless you, no! Not less money!

The witness withdrew.

SECOND DAY.

Saturday, 14th September 1912.

At Belfast.

PRESENT:

COMMANDER SIR HAMILTON FREER-SMITH, R.N., C.S.I. (*Chairman*).

MR HENRY CUMMINS.
MR. HERBERT EWART.
Professor J. E. PETAVEL, F.R.S.
Professor LORRAIN SMITH, F.R.S.
MR. D. R. WILSON (*Secretary*).

Mr. T—— G—— called and examined.

352. (*Chairman.*) What are you by trade?—A weaver.

353. Where do you work?— ——.

354. How long have you worked for that firm?—Two years.

355. How long have you been a weaver?—About 20 years.

356. Where you work now I fancy it is fine goods, is it not?—Yes.

357. Damask?—No, linen.

358. Fine linen?—(*Mr. Cummins.*) Yes, mostly all fine counts.

359. (*Chairman.*) Have you ever worked where coarse material is manufactured?—Yes, from 10^{00} up to 22^{00}.

360. (*Mr. Ewart.*) Are those boiled yarns, 10^{00}?—No, green yarns We work 9^{00}.

361. (*Chairman.*) That is at present. I am talking of your former experience?—Yes, my former experience was over 9^{00}.

362. (*Mr. Cummins.*) The 9^{00} is in the coarser stuff that is woven. It is only on rare occasions it is 9^{00}?—Very seldom. You never see one now at present.

(*Professor Petavel.*) Had not we better just get that a little clearer so as to obtain some definition? What is it?

(*Mr. Ewart.*) That is the ordinary setting?

(*Mr. Cummins.*) The ends in the warp.

(*Professor Petavel.*) So the expressions "ten hundreds" or "twenty-two hundreds" signify that there are 1,000 or 2,200 ends in a width of warp of 20 inches.

363. (*Chairman.*) Yes. I take it we have two extremes; one is very coarse and the other is very fine?—That is it.

364. Do you know anything about any intermediate counts? Can you tell us anything about the intermediates? I mean to say, are there any counts of cloth woven between the two counts we have now described?

365. (*Mr Cummins.*) Yes, you start with 9's, 10's, 11's, 12's, 13's, 14's, and right up?—We have had from 9^{00} up to 23^{00}. The finest, I think, was 24^{00}. I only saw one beam of that in a length. I have woven 23^{00} myself.

366. (*Chairman.*) Have you been accustomed since you have been a weaver to have artificial humidity? By artificial humidity we mean either steaming or water spray or steam and water mixed?—I have worked with them both.

367. In what class of goods is it necessary to have the most steaming?—Well, in the coarser kind.

368. (*Professor Lorrain Smith.*) The coarser the thread the more necessary it is to have steam?—Well, it might not be more necessary: it is according to the damp of the shop.

369. (*Chairman.*) And what about temperature? In which class of goods is it necessary to have the highest temperature?—The high one would be the coarse.

370. Your opinion is that for cambrics you want rather less temperature and rather less moisture than for the coarser material?—Yes.

371. (*Professor Petavel.*) But I thought that damasks, for instance, were woven without any humidity at all? And they are coarser?—I do not know anything about damask.

372. That is too coarse for you altogether?—I know nothing about damask.

373. (*Chairman.*) What time of the year do you feel most comfortable? What time of the year is the most comfortable for the workers in the shed?—Generally before noon of the day.

374. But, first of all, summer or winter?—Well, I cannot say very much about our shop. In the winter they have heaters in, because it is a very damp shop in itself, and that is the reason why they have to have the heaters in.

375. But you were going on to say it is more comfortable in the morning than in the afternoon?—Yes, about 12 o'clock it is perhaps nice and comfortable.

376. Does it ever get oppressive?—Yes.

377. Both summer and winter?—Summer-time.

378. About what time does it begin to get oppressive?—Just about 12 o'clock.

379. How long does that last?—Until 6 o'clock—five hours.

380. And do the workers suffer any inconvenience at all from this heat?—Speaking from experience, I have had to go home and change my shirt and drawers.

381. During working hours?—After I get done. Of course I have that to do.

382. But did it produce any feeling of tiredness?—Yes, I felt very tired.

383. When you leave your work after a day of that sort do you feel more tired than in cooler weather?—You just feel like lying down after you get home. That is my experience. I feel like lying down and staying there.

384. To what do you attribute that?—The heat. The heat in the summer.

385. Do you think that the question of moisture has anything to do with it, or would it be the same if there was no moisture?—That I could not say, because in the summer-time we need the moisture to keep the yarn in proper order, but sometimes we get too much of it.

386. You sometimes get too much?—Yes. Then we get the heat and the moisture together, and it affects the system.

387. Have you ever considered, or ever looked at the thermometers in the shed?—No, I have not. I have looked at them like in the summer-time to see how high it has been, or the damp.

388. What is about the highest you have seen?—I have seen it over 80°, and when it is over 80° it is very hot.

389. Do you think that the workers suffer from that in health?—Yes.

390. (*Professor Lorrain Smith.*) In what way?—Well, they are never themselves. They never have the same grit with them, or go.

391. (*Chairman.*) Do the workers belong to any Sick Society?—Some do.

392. Do you know if we could get any statistics as to the health of the workers?—No, I cannot say.

393. Do you know if anybody gets any sick pay from any society?—The Friendly Society?

394. Yes?—There are some workers get sick pay.

395. Would not the Friendly Societies know how often the workers were off their work from sickness?—Yes, they would.

396. Could we get any statement from them as to the number of workers that are off from sickness?—I do not know that. I could not say.

397. What is the name of this society?—Well, there is the Back Lane Friendly Society, and the Free Gardeners, and the Rechabites.

398. Are they all in your district?—Yes.

399. (*Mr. Ewart.*) These are all large societies with branches in your district?—Branches, yes.

400. (*Chairman.*) At any rate, they would know what workers were off sick, I suppose?—Yes.

401. You have told us that in your opinion during the hot weather the weavers suffer bodily discomfort?—Yes.

402. And that they suffer in health?—Yes.

403. Have you ever considered what is necessary for satisfactory weaving?—Just for the moment we will put aside the health question, and think we are only considering what is satisfactory weaving. Have you ever considered how much heat is necessary and and how much moisture for satisfactory weaving?—Yes, I have. I have seen the glass go to about 76° with heat or 77°. It is just warm, and when it goes from 70° to 72° in damp it is just nice and nice weaving, where it is about 72°.

404. Are you talking of the wet or dry bulb?—The wet bulb. From 70° to 72° it is fair weaving.

405. What difference between the two thermometers?—Generally 2° or 3°.

406. What do you think is necessary? Have you ever considered that?—Yes, I have seen the glass when it was about 75° or 76°, and it is just warm.

407. (*Professor Lorrain Smith.*) What do you mean exactly by that? To take the two bulbs, what would you regard as just warm enough?—The dry bulb about 76°.

408. And the other one?—About 72° or 73°.

409. Seventy-two degrees would give you 4° of difference?—It would.

410. Would that be right?—About 72°. The wet bulb would be right at 72°. It would be damp enough.

411. It would be damp enough with the dry bulb at 76° and the wet bulb at 72°?—Yes.

412. That would be 4° of difference?—Yes.

413. (*Chairman.*) Now supposing somebody said to you that it was necessary for satisfactory weaving that the wet bulb thermometer should go up to 77° or 78°: would you agree with that?—Oh, I should say it is too damp—too damp for working.

414. (*Professor Petavel.*) Do you mean too damp, or do you really mean too hot?—Too damp, when you go up to 76° with the wet bulb, it would be too damp.

415. (*Professor Lorrain Smith.*) If the dry bulb were what though?—77°.

416. Assuming the dry bulb remained at 77°, if the wet bulb went up to 76° it would be too damp?—Yes, it would.

417. (*Chairman.*) I do not know if you have ever heard that there were regulations made for cotton weaving?—No.

418. Supposing somebody said to you that there was a proposal that there should be no steaming or humidity after the wet bulb got to 75°, what would you say to that?—I beg your pardon.

419. Supposing somebody said to you that when the wet bulb thermometer got to 75°—do you follow me so far?—Yes.

420. That then there should be no more artificial humidity: that is, steam shall be cut off when the wet bulb gets to 75°; what would you say to that?—Even if the steam was cut off at that time my opinion is that the damp would remain for a certain length of time in the shop, because it remains in the shop after the steam would be cut off.

421. You cannot, I daresay, say for how long?—No.

422. (*Professor Petavel.*) Would that mean that in your opinion you could go on weaving quite well afterwards?—Not at 75°. If it got 75° it would remain at that in the shop; the shop would remain damp. You will even get the floor damp, and you cannot dry the floor.

423. (*Professor Lorrain Smith.*) That damp would get used up after?—Yes, the damp rises.

424. What would be done then, when that damp is used up?—They would have to turn it on again.

425. Otherwise if you did not turn the steam on what would happen?—You would have to remain as you are, but it generally never goes out to the next morning. I have seen the floor wet when you leave at 6 o'clock at night, and when you return in the morning it is dry.

426. The idea would be that at 12 o'clock, let us say, the wet bulb got to 75°; then there was no more steam or humidity on. Could you go on weaving until 6 o'clock?—Yes.

427. Without any more?—Yes, I believe you could go on to 6 o'clock without any more.

428. (*Professor Petavel.*) You would not got too many breakages?—No, I do not think so.

429. (*Chairman.*) You do not know that this has actually being tried?—I do not. I never saw the steam turned off for that portion of time.

430. Do you got any moisture or condensation coming down on your looms?—Sometimes.]

431. Much of it?—No, not in our shop.

432. Where do you put your clothing?—Hang it up on the wall.

433. In the shop?—Yes.

434. Are the walls dry?—Well, not the one I am working beside.

435. You say they are not dry. Is that due to the condensation of the moisture in the shed?—Well, I could not say that.

436. You do not know the cause; but do you say the walls are wet or are they dry?—Yes, they are damp for about 18 inches up.

437. And do you hang your clothes on the damp walls?—You have to hang your coat up on the wall. Of course there is some as has a cord across from loom to loom, and they put it there.

438. (*Mr. Ewart.*) How high is that factory above the river?—I could not say.

439. You do not know the situation of it?—I think about 20 feet.

440. (*Mr. Cummins.*) Have you a cloak room?—Yes.

441. (*Chairman.*) Have you anything else you would like to say? Of course I have asked you a lot of questions, but I do not know that there is not something that you may wish to say?—I do not think so.

442. Have my questions covered all you would wish to say?—Yes.

443. Nothing else strikes you?—No, there is nothing strikes me.

444. I think you are piece-workers?—Yes.

445. If any legislation were made that would cause more piecing your wages would probably be rather reduced?—Yes.

446. Have you considered whether you would prefer to have, say, more work and less wages, I mean to say, supposing the steam were reduced it might mean more work and less wages, have you considered that?—Well, that is true; it would mean more toil; but at the same time my opinion is that if the shop could be kept at a certain degree of damp there would be no call for toiling so hard.

447. That degree you have told us.

448. (*Professor Lorrain Smith.*) You complain of this damp and heat?—Yes, especially in the summer.

449. Have you any suggestion as to what could be done to get over the difficulty?—I have not.

The witness withdrew.

Mr. H—— M—— called and examined.

450. (*Chairman.*) What are you?—A weaver.

451. How long have you been a weaver?—I was in the Army some time and then I came back. I suppose I have been 15 years at weaving.

452. Since you left the Army?—Yes.

453. Where have you worked during the 15 years?—I have worked in three factories, but the longest I have been is in ——, Limited.

454. Is that where you work now?—Yes.

455. What class of goods do they manufacture?—Cambrics.

456. I suppose they use steaming or humidity?—Steaming.

457. Is it only steam there?—Steam.

458. (*Professor Lorrain Smith.*) Steam jets?—Yes.

459. (*Chairman.*) Do you consider that this steaming is necessary for satisfactory weaving?—Yes.

460. Do you consider that there may be too much or too little?—Sometimes there is not enough, and at other times there is too much.

461. What is the effect when there is too much?—When there is too much you get stopped in your work, and when there is excess of heat and steam together you are in a kind of—I don't know what sort of state you are in in the factory.

462. You are now talking of your health?—Yes.

463. I take it you suffer bodily discomfort?—Yes.

464. Does it affect your health?—It does.

465. Have you ever been off from work on account of it?—An odd time I have been off with excess of cold—like a kind of feverish state.

466. That is cold?—Yes.

467. Have you ever been off on account of the excessive heat?—No, I have been able to stand the excess of heat.

468. But you say you suffer bodily discomfort?—Yes.

469. How does it affect you?—It affects you in that sort of state. Whenever you go home at night you are like—I could not describe to you the state you would be in—something like a dead dog nearly, as the saying is.

470. Have you ever looked at the thermometers that hang in the shed?—I have not looked at them very regularly, but last Thursday I looked at them and it was rather hot and damp, but there was a muchness of both. It was 80° dry and 79° damp.

471. What made you look at the thermometers on that day?—It was more damp on that day than any other day. The floor was a bog too.

472. Was it on account of any feeling you had that made you go and look what the temperature was?—No, just as I was passing by to go for my bobbins.

473. On that day did you experience the feelings you have described?—Yes, at night. I went out for a few minutes to stand at the door after I came home and got my tea, and I had to come into the house and sit down at the fire in a trembling sort of state.

474. I think you told us you think that steaming or moisture is necessary for satisfactory weaving?—Yes.

475. Have you formed any opinion as to when it should cease?—Yes, sir, I think there should be something to prevent it after it goes up to about 74° or thereabouts—73°.

476. Supposing it were cut off, as you say, at 73° or 74°, do you think you would be able to weave satisfactorily?—Yes.

477. You think you would?—Yes.

478. Have you ever tried it? Has it ever been tried?—Well, I do not think it has been tried, not to cut it off, as far as I know.

479. Do you belong to any Sick Society, any Friendly Society?—No.

480. Any society where, if you went off sick, you would get any benefits?—Sick benefits, no.

481. I am not talking of the new Government thing?—No, I do not belong to any society at all.

482. Have you formed any opinion as to the general health of the people working in the sheds in your neighbourhood?—I have formed the opinion that sometimes they have to work when they are not fit to work.

483. We should like to hear from you in your own words, if you can suggest anything that would, without really interfering seriously with the trade, add to the comfort of the workers in your shed?—Well, there is ventilation. If we could get ventilation it would go really to the comfort of the workers.

484. Anything else? What about the clothing being hung up?—Well, there are pegs round the factory for hanging clothes on.

485. Are the walls dry?—The walls are damp enough.

486. Are the walls dry?—No.

487. Would it be any benefit if you had, say, some waterproof material between the wall and where the clothing is hung up?—It would. Sometimes in the winter-time I believe it is not really to the health of the people after they quit their work in the evening to lift their coats off the damp wall. If you go to work and it happens to be raining the coat remains in the same state to go home again; there is no drying in the factory.

488. (*Professor Lorrain Smith.*) You say you suffered yourself from a cold and fever?—Yes.

489. Was that in winter and summer?—More in the summer-time than in winter.

490. More colds in the summer?—Yes. In fact after you have done at night you are all afraid to go out into the air at all sometimes when you are in that sort of state, with wet shirts.

491. That is chiefly in summer?—Yes, chiefly in summer.

492. (*Professor Petavel.*) Do you find that the work is more difficult when the moisture is reduced? If there was more difference between the bulbs, if the steaming was partly turned off, do you think the workers would have more work, more piecing to do?—If the moisture was turned off on a real drying day they would have more to do, but sometimes they have too much to do whenever there is too much moisture.

493. Can you suggest any reason for keeping the moisture of the shed higher than is necessary for good weaving? I presume the weavers would complain that the moisture in that case was too high for the even weaving? Is not that so?—Well, the higher it is the cloth goes together better.

494. The weaving is better? I thought you were saying it was not?—The cloth goes together better, but the weaver suffers.

495 So less moisture means more work?

(*Chairman.*) Up to a certain point, I think?

(*Professor Petavel.*) Yes.

496. You think the weavers would be willing to put up with more work to secure greater comfort by having less moisture?—Yes, I believe they would

497. (*Mr. Cummins.*) You really think too much moisture is as bad as too much dry?—Yes, it is bad for the weavers, too much moisture.

498 (*Professor Petavel.*) What would you put as the best amount of moisture? Would you have the two thermometers, the wet bulb and the dry bulb, 2° or 3° or 4° apart? I expect they are usually kept 2° apart. Would you have them more apart than that, less moisture than that? That is your wish, is it—less moisture than at present?—Than at present

499. All the year round less moisture than at present?—Yes, in the summer especially.

500. (*Professor Lorrain Smith.*) Sometimes?—Yes.

501 Sometimes you would want rather more?—Yes, whenever there is a drying wind, a windy day, but if it is a real damp or a heavy day and with a real heat that is the time that the weaver suffers the most, excess of heat and moisture together.

502. (*Mr. Ewart.*) That is, a day that is oppressive out of doors is oppressive indoors?—Yes

503. (*Professor Lorrain Smith.*) Then it is these days you complain of? On these days there is too much steam?—Yes It wants ventilators to take it away.

504. You think you would still work better?—Yes

505. (*Chairman.*) I might just ask you, had you any illness when you were abroad?—Yes, slight touches of fever

The witness withdrew.

Mr. J—— H—— called and examined.

506. (*Chairman.*) What are you?—A power loom weaver.

507. How long have you been a power loom weaver?—Thirty-one years.

508. And what sort of health do you enjoy?—Well, I enjoy fairly good health at certain periods of the year; better health now than in the summer season.

509. Better health in winter than in summer?—Yes.

510. Have you worked continuously as a weaver all these years?—Yes.

511. You have not been away, abroad?—With the exception of a short period when I was in Scotland, only about six months.

512. You were working as a weaver in Scotland?—No, as a labourer.

513. For how long was that?—I was twice during that time in Scotland. Once I was about 12 months and another time six months.

514. You say you have better health in the winter than in the summer?—Yes

515. How do you account for that?—On account of the excess of heat in the factory and the loss of sweat. I cannot even take my meat as well in the summer season as in the winter.

516. Have you been obliged to give up work at any time during the summer?—Many a time I have had to take an afternoon off.

517. And you said the reason of that is the excessive heat?—The excess of heat.

518. For instance, take last summer, not this summer, but last summer—it was a very hot summer, I think?—Yes.

519. On a Sunday on a very hot day when you were not working, or a Saturday afternoon, do you feel the same symptoms outside as you do inside?—No, I feel a deal better outside when I get out in the air. I feel a lot stronger in the air.

520. How do you account for that? I mean supposing it was a very hot day outside. Why do you think you would feel better outside than inside?—Well, I account for it that I believe it would be a healthier class of sweat, not so suffocating as the inside would be; I would not be so suffocated.

521 You mean the sweat would evaporate and dry up?—Yes

522. You mean your clothes would keep dryier outside than in?—Yes; I mean to say I would have better class of breathing—better air.

523 Supposing that to be correct—and I daresay it is correct—can you account for it? Can you account for the fact that you feel the sweat more inside than out?—It is on account of the heat of the place—the damp

524 Do you think the steaming has anything to do with it?—Yes.

525. You have got steam inside but not outside?—Yes, the steam has a lot to do with it.

526. What difference does it make?—I feel a lot of difference.

527. You feel more comfortable outside than inside?—Yes.

528 And do you think that it is the steaming that makes the difference?—I do.

529. Then you think that in the very hot weather the steaming produces discomfort to the workers?—It does.

530. Does it affect their health?—Yes.

531. As a weaver do you think steaming is necessary for weaving your goods?—Yes, to a certain extent, from about 65° up to 70° or 72°.

532. Are you talking now of the wet bulb thermometer?—Yes.

533. You know there are two bulbs? Do you understand thermometers?—Yes.

534 One is a dry bulb and the other a wet bulb thermometer?—Yes.

535. Just let us understand what you mean. You say from 65° to 72°, is that it?—Yes.

536. Is that on the wet bulb or dry one?—On the wet.

537. Do you ever look at the thermometers in your shed?—Sometimes.

538 From time to time have you looked at them?—Yes.

539. What is the highest you have seen?—I have seen it up to 80°.

540. Wet bulb?—Yes.

541. Now was that necessary for good weaving, do you think?—I cannot hear very well

542. You said that the wet bulb thermometer sometimes goes up to 80°?—Yes, the heat goes up to that

543. The reading of the wet bulb thermometer is 80°?—Yes.

544. Have you yourself seen the thermometer registering 80°?—Yes

545. Now is that necessary for good weaving?—No, I do not think that it is. I think it is unnecessary.

546 Up to what extent would you think necessary?—I should think from 65° up to 72°.

547. I will just put this question to you. Supposing the Government said that at 75° there must be no more steaming, would that interfere with your weaving—No, sir, it would not.

548. Do not you think there would be a great deal more breakages and more piecing, and therefore harder work?—No, I do not think it would interfere in that respect, but when there is excess of damp there is a lot of inconvenience to the worker. For instance, he has to stop one loom where he is taking off the web. In the event of taking off the web the loom would be stopped while they are finishing off the web and there would be no possibility of getting that loom to work

for a long time. It even affects the machinery. The warp gets damp and the shuttle sticks.

549. (*Professor Petavel.*) You say that on a certain afternoon there is too much steam for good weaving?—Yes.

550. Why do they put on more steam if the weavers do not want it? The employers do not want bad weaving surely? Can you explain it?—There is not a regular system of looking after the steam so far as I can see. The steam is turned on when you go to your work and there is seldom any alterations made in the steam.

551. It is simply carelessness in regulating?—I could not say that it would be carelessness altogether, but as a result the tenter turns the steam on and they never make any alterations except at a rare time.

552. What occurs when the weaver says it is too wet to weave well; does not the tenter turn it off?—A great deal depends on the weather. If it is damp weather and the steam is turned on it would cause it to be too damp inside the factory.

553. (*Professor Lorrain Smith.*) Yes, but when the weaver says it is too damp what happens?—The tenter would turn of the pipe for a bit—the jet pipe. In some cases the workers take it in hand themselves.

554. (*Mr Ewart.*) You have complained to the tenter that there was too much moisture?—Yes.

555. You have yourself?—Yes. I have turned it off myself. You can turn it off yourself. It is just like the top of a milk can. With a small wrench you can turn it off a little for yourself.

556. (*Chairman.*) Supposing there is too much moisture, what do you do?

557. Is there anything you can do besides turning it off?—They have to use French chalk sometimes.

558. They use French chalk?—Yes.

559. That is on the beam?—They put it on the shell of the loom, because the yarn goes over the shell, and if the shell itself is sticking there is another disadvantage to the worker. If you happen to be half a day off and the machinery was not looked after when you came to use it again it sticks, and the yarn sticks, and the result is you cannot get on with work.

560. That French chalk is to absorb some of the moisture?—Yes.

561. Because there is too much?—To make the yarn slip over the shell.

562. (*Mr. Ewart.*) To make the yarn or the beam slippery?—Yes. It gets moist and sticks to the shell, and it makes the yarn kind of slippery. In some cases it has to be put on the gears as well.

563. (*Chairman.*) Now we have asked you questions, but we would like to hear from you any reasonable suggestion that would make the work more comfortable for the workers. If you could think of anything, tell us now?—I have worked about thirty years with what I call the jet steam pipe. I do not know whether it is the proper term or not. For the last twelve months I have worked in a factory where there is humidity.

564. I forget what factory you are working in?—
——

565. There they do not use steam, but they use water for humidifying?—It is a mixture of steam and air.

566. (*Professor Petavel.*) And it is cambric goods?—Yes, steam and air.

567. But you are weaving cambric?—Yes.

568. It is fine weaving you are doing in that factory?—Yes.

569. (*Chairman.*) Tell us about that?—I believe, sir, that is a better system. I have never seen the same damp in that firm as I have in the other firms. It is cooler,

570. Is it cooler in the summer?—Yes, it is; and another thing, they can work the humidity to make the place cold.

571. (*Professor Petavel.*) Do you know the name of the machine that brings in the moisture? You know there are various machines with names such as Hart's or Parson's. Has this one a special type?—It is called the humidiator.

572. Has it long pipes?—It has a large pipe with holes in it. There is a large fan for pumping in air. The steam comes from the boiler the same as the other steam comes, but the air is also pumped in by the fans and the air forces the steam through the humidifiers.

573. (*Professor Lorrain Smith.*) It is not the Matthews and Yates' system?—I could not say.

574. (*Professor Petavel.*) You consider that is better than the steam jets—more comfortable?—It is more comfortable. In the other firms where the ordinary jet steam pipe is used there is always a dampness and damp dropping on the worker. The floor is always damp, but it is not the case in the firm where the humidifier is. I have worked at both firms, and I am at present working where the humidifier is.

575. Has your health been better?—A great deal better. I may tell you that I was subject to a disease that most people say damp is the cause of. I never have felt anything like as bad since I went to the other factory where there is a humidiator.

576. You said you had often to take an afternoon off?—Yes.

577. What do you mean by often? How often would it be in the summer?—It might be once a week. Of course we could not afford to take it often.

578. Was that a common experience? Had you to go off as often as other people? Your neighbours working round you: had they to go off as often as you?—Yes, there are any amount of people according to their abilities. Some people can stand it better than others can.

579. Were you one of those that stood it well?—One of the pretty constant workers.

580. (*Professor Petavel.*) Have you found it the same this summer as last summer?—There has been no great excess of heat this summer. I have not had any reason to knock off this summer.

581. You have not been off at all?—No.

582. But last summer you were frequently off?—Yes.

583. About once a week?—Yes.

The witness withdrew.

Mr. H—— J—— M—— called in and examined.

584. (*Chairman.*) Are you a weaver?—Yes.

585. How long have you been a weaver?—Fifteen years.

586. Without any break?—Well, there was a break.

587. For how long?—Two and a half years.

588. What were you doing in that time?—Serving on a bread van, distributing bread through the country.

589. That would be outdoor work?—Yes.

590. Do you consider your present occupation a healthy one?—Well, not so healthy. It is not as healthy as when I was outside, a number of years ago.

591. You mean you were more healthy when you were distributing the bread?—I was fair.

592. I suppose it did not pay as well?—There was not anything that I had against it, except sitting in wet in the winter. That was what I had against the bread.

593. You say you do not consider your present duty a healthy one?—I do not, neither winter nor summer.

594. Tell us what makes it unhealthy, if you can?—Excess of damp and excess of heat—an excess of damp comes both winter and summer, and excess of heat in the summer. We have excess of damp by drops from the roof. There is a shower comes down on you when you go in the morning, and if there is a little frost the roof is just in a sheet of water, and when the heat is put into the pipes that comes down

about you. They put up what they call paper kites over where you are weaving. There was nothing over where we are standing and it all dropped down about you in a shower, and drops down the back of your neck. After the day's work the next morning you are all shaky. You get too warm. The fact is you are ready for your bed when you go home that night. You have a cold, and you are all feverish.

595. That is in the winter?—That is in the winter. That occurs the whole winter through.

596. Now tell us about the summer?—In the summer the excess of heat leaves you in a dormant state. You do not care whether you go home or not. You really want your meat if you travel any distance. You can feel the sweat run right down your legs into your boots. The floor as well is not in the condition it ought to be. The heat causes the damp to rise up out of the floor.

597. Can you suggest anything that would make it better for you?—Yes, proper ventilation. I would think proper ventilation should keep the floor dry. There is no what I call ventilators at Messrs. ——

598–9. (*Professor Lorrain Smith*.) That is where you work?—Yes.

600. (*Professor Lorrain Smith.*) What do you weave?—Cambrics. I can weave anything from 10ers up to 24ers.

601. (*Chairman.*) You were telling us what you thought would make it better for you. You have told us ventilators?—Those ventilators at Messrs. —— are what I call no use. I have worked in other factories where I have seen better makes. They are driven by a piece of tape between the shafting, and there is a wheel drives off the shaft, and this tape goes round the pulley and drives the ventilators. The ventilators are very small. They make no impression. In fact, they are to keep the roof dry; they are not to keep the floor dry; and there is too little of them. If there was more they would keep it far drier. Last year, June 1911, there was a deputation of fourteen of us went out.

602. Went where?—To Mr. —— just on this matter, excess of heat and excess of damp.

603. What day was that?—In June. I do not remember the day, but it was in June 1911.

604. June last year?—Yes. It was very warm at the time. It registered 93° damp and 96° dry bulb the day we went out. I was selected by the fourteen as spokesman. They were all wanting drinking water. I told him what the conditions were, that we could not get breath. We were breathing nothing only hot air. You could not get your chest out; it was all catching here and you felt the effect on your shoulders here behind. You felt the effect on your shoulders, and you were in that state that you could not get your breath. Sometimes you would rush out to the door and get air, and when you came in after doing that you were in a worse state than before, because the air made the sweat just pour out of your arms here. I put it before Mr. ——. We, as men, were bad enough, but it was nothing to the women. It was awful to see the state of the women, throwing off their corsets and all. They could not stand it. He said, "What would you suggest we could do to cool it?" "Well," says I, "run water on the roof"; but I heard that another manufacturer had put it on and had stopped it because the roof was not waterproof, and I thought I was wrong because it would cause more damp. I said, "Or could you blow in air?" They had gas pipes, and could have blown in air through gas pipes. I suggested that to him, and he said he would see about what he would do. He said the inside manager was to have the windows open here and there. They could open the roof too and let in air; so I said, "Could not they open the roof and let in air?" The inside manager said, "No, it would put the weavers past weaving, the yarn will not stand the air coming in." He said, "Would not you be better suffering a little and making more money than have the air blowing in and you making no money?" I said, "We know it takes some steam to work the yarn; we could not work without it; but," I said, "what we want to get is something to cool the shed, because we cannot stand it at 93°. We might stand 80°, but it is impossible to stand what we have." He said, "We will see what we can do if you go to your work." That was early in the morning, 11 o'clock, and at dinner-time they opened the three doors of the weaving shed, and when we come in we felt it a little cooler, but the doors were all shut once we got in at 2 o'clock, and it was not very long before it was up to the same again, as bad as ever. They did it for three days in succession, and we just got sick of it. I took a note of what is registered from the time that the Committee was visiting the factories, and I noticed also that what they put up did not correspond with these. I took it at 4 o'clock or a quarter past 4 in the afternoons, always.

605. That is the readings?—Yes.

606. On what dates?—They were taken from July 24th until yesterday. I have it each day.

Wednesday,	July	24th	- 80° dry,	77° wet.
Thursday,	„	25th	- 81° „	78° „
Friday,	„	26th	- 83° „	80° „

I did not take Saturday because it was only a half day.

Monday,	July	29th	- 77° dry,	74° wet.
Tuesday,	„	30th	- 76° „	73° „
Wednesday,	„	31st	- 75° „	72° „
Thursday,	August	1st	- 75° „	72° „
Friday,	„	2nd	- 77° „	74° „
Monday,	„	5th	- 72° „	69° „

That was one of the best weaving days.

Tuesday,	August	6th	- 75° dry,	75° wet.
Wednesday,	„	7th	- 77° „	76° „
Thursday,	„	8th	- 75° „	74° „
Friday,	„	9th	- 72° „	71° „
Monday,	„	12th	- 72° „	70° „
Tuesday,	„	13th	- 74° „	72° „
Wednesday,	„	14th	- 70° „	68° „
Thursday,	„	15th	- —	—

I was not in that afternoon.

Friday,	August	16th	- 72° dry,	71° wet
Monday,	„	19th	- 75° „	74° „
Tuesday,	„	20th	- 70° „	68° „
Wednesday,	„	21st	- 71° „	69° „
Thursday,	„	22nd	- 71° „	69° „
Friday,	„	23rd	- 77° „	75° „
Monday,	„	26th	- 74° „	72° „
Tuesday,	„	27th	- 78° „	76° „
Wednesday,	„	28th	- 73° „	71° „
Thursday,	„	29th	- 72° „	70° „
Friday,	„	30th	- 74° „	72° „
Monday,	September	2nd	- 71° „	72° „
Tuesday,	„	3rd	- 75° „	73° „
Wednesday,	„	4th	- 74° „	72° „
Thursday,	„	5th	- 70° „	68° „
Friday,	„	6th	- 72° „	70° „
Monday,	„	9th	- 72° „	70° „
Tuesday,	„	10th	- 71° „	69° „
Wednesday,	„	11th	- 74° „	73° „
Thursday,	„	12th	- 79° „	77° „
Friday,	„	13th	- 76° „	79° „

That was yesterday.

607. (*Professor Lorrain Smith.*) That is wrong, surely?—No, that is correct yesterday. That was an experiment they were using. The dry was three degrees below the wet yesterday.

608. (*Chairman.*) At what time of the day?—At a quarter past 4.

609. These readings were all taken about the same time?—All at that time.

610. You seem to have taken an intelligent interest in this question. Can you tell us whether it would be possible from a weaving point of view to stop humidifying at any particular reading of the wet bulb thermometer?—I beg your pardon?

611. In the cotton trade—and mind you the cotton trade is quite different to this, and it must not at all follow that because something is done in the cotton trade it can be done in the linen trade?—I worked 12 months at cotton.

612. In the cotton trade it was found possible to make a regulation that when the wet bulb thermometer

got to 75° there should be no more artificial humidity Do you follow me so far?—I do.

613 Do you think that any regulation of that sort —I do not say 75°, but any regulation of that sort at all—would be possible in the flax weaving trade?—Yes We were stuck over 72°. With fine yarn it is impossible to weave at that.

614. At what?—At 75°. It is an impossibility It is impossible to weave over 72°, because the whole selvedge drops out.

615. Do you mean that steam ought to be cut off before 75°?—Yes; I think with the dry bulb at 75° and the wet at 72°, if you could work under those conditions it would be what would be humane like; we could stand it.

616. But could the weaving stand it?—Yes, the weaving could stand it, because I have taken note that each day that we had 72° and 74° it was the best weaving day. That is agreed to by all the workers in the place. But where these readings are taken is in the centre of the shop, and it is a very dry place. Right round the walls there is wet, and the floors are a whole mass of water. A good deal of it is because it is not sanitary—the dirt not properly cleaned off, and when the damp gets on to that it makes it more moist and the dirt sticks to your feet. The damp gets far worse because of that. There are two walls in particular, the top wall and the end wall, where the water lies and is never brushed away. It comes sucking out through the foundations or some place, and that causes the damp to be far in excess of what it is where the readings are taken, because where the readings are taken it is not near the steam pipe. If it was put at these walls I am sure it would register 5° or 6° more in damp.

617. (*Professor Lorrain Smith.*) When you say it is impossible to weave at over 75° you mean while cutting out your cloth the loom would go on weaving?—No, sir, not go on, you stop.

618. But apart from the stopping it would go on all right?—I could go on.

619. On July 26th the temperature was 83° and 80°: the weaving was going on all the time?—No, it was not. It might be with some party now and again, but it was not going on because you were losing your whole time tying yarn

620. You described taking the cloth away from the loom?—Taking a cut off.

621. You described that. Would the looms not go on weaving?—No, not when you are taking the cloth off.

622. Apart from that, supposing you were not taking the cloth off?—Yes, if you were not taking your cloth off the looms would be going on weaving.

623. Would there be much piecing?—Yes. The damp would cause far more breaking. There would be knots, or what you call a slug on your yarn. It comes through rods first and then through heddles. Those heddles are working up and down and that takes the whole dressing off the yarn; it works it into tow with an excess of damp. The excess of heat just takes the same effect. That is the cause of the manufacturer putting on excess of damp in the summer-time, because excess of heat raises excess of damp. The webs will all get broad and to fetch them in they put more steam on. There would be no call for that if they had not the excess of heat, because this weather there is no call for it. Right enough last summer there was an excess of heat. I did not take these readings until this Committee visited the place, but it went up nearly as high this year as it did last year. In the month of June this year there were three weeks when we had to strip vests and all off. The heat registered 89°.

624. (*Professor Petavel.*) Your general impression is that the shed is kept much too hot?—Yes, and much too damp. I might also state this, that before the Committee visited us we were far damper than we are now. They have taken more interest. There was no interest taken in the thing only one of the foremen ran up and just took the readings and marked it off. I went down and took the readings after 6 o'clock to check them. I have seen it 3° higher even than I have here registered it, and another time I have seen it 3°, 2° and 1° lower than mine.

625. (*Chairman.*) Do you think the operatives have confidence in the way the readings are now taken? Do you think the operatives think the readings are correctly returned always now?—I think they do not mark them correctly. I think they work them to answer themselves. I did not understand they did any such thing until I took a note of these, and when I went and saw what they had marked up——

626. Assuming that it is correct or not correct, what do you think would be a good way of taking readings that the operatives would have confidence in?—Well, a self-register. If there could be a self-register it would be the best reading that the workers would have confidence in.

627. Of course self-registering machines require an immense amount of attention. It would really require one man to look after five or six factories with self-registering machines. I think that is so, is it not?

(*Professor Petavel.*) Yes.

628. (*Chairman.*) But supposing you cannot have self-registering machines, is there any method of taking readings which you think would give confidence to the workers?—Well, I could not suggest any.

629. Do you think in each factory the workers might suggest to the firm that one of their number should take the readings with the representative of the firm?—It is a very good idea, but at the present time there is not one worker in any of the firms would have done what I have done; they are afraid of being victimised if they took the readings. In the other factories they are afraid to do the same as I do.

630. I presume your employers are quite ready that you should do this: they want the truth to come out?—It has come from the Trade Union, and I was a member of the Trade Union and took an interest in it. There is just one thing I would suggest in the shop where I work, and that is the cause of the water on the roof is the way it is sheeted; with the run of the timbers it comes all down to one side.

The witness withdrew.

Mr. W—— B—— called in and examined.

631. (*Chairman.*) Are you a weaver?—Yes.

632. How long have you been a weaver?—Over 14 years.

633 Where have you worked during those 14 years?—In Lurgan.

634. That is————?—Yes.

635. Do you consider your occupation a healthy one?—No, it is not.

636. Tell us why not?—In the first place it would drown you with dampness on the floor, and you could not work in it for being too damp.

637. (*Professor Lorrain Smith.*) Do you complain of the dampness on the floors especially?—Yes.

638. (*Chairman.*) What else?—The drops off the roof dropping on your shoulders when you are working.

639. Anything else?—And it is damp all over where you are working sometimes.

640. Do you mean the atmosphere?—Yes.

641. The air?—Yes.

642. And you think there is too much?—There is too much, because sometimes you are half-an-hour stuck with the yarn.

643. (*Professor Petavel.*) What do you mean by that?—The damp all over with the steam blown out.

644. How do you mean, "stuck with the yarn"?—You cannot get it woven with the damp.

645. What occurs? Do the ends break?—Yes.

646. They break more than if it was dry?—Yes, in plain yarn especially.

647. (*Chairman.*) Do you know there are thermometers in your shed?—Yes. You look at them some odd times.

648. Have you ever looked at them when the condition you describe was on?—Yes, at 65° or up to 70° or 72° the yarn works well.

649. That is 72° on what reading—wet bulb or dry bulb?—That will be the damp bulb.

650. You say it works well?—Yes.

651. And when does it begin to work badly?—Well, in the winter especially it is too damp.

652. At what reading?—Well, the drops off the roof cause the floor to be a real gutter sometimes.

653. When does it begin to get too damp: when the thermometer goes up to what?—When it goes over 75° you could not work at all.

654. What is the highest it has gone up to in your shed?—I could not tell you the highest it goes up to.

655. Up to about what?—90° I suppose it would be sometimes in hot weather.

656. Did they stop working when it got above 75°?—No, they did not.

657. But you said you could not work it at all?—There would be many a time I would be stuck.

658. But when you said you could not work it at all I suppose you meant you could not work it conveniently?—Yes, it would stick with the damp.

659. (*Professor Petavel.*) Do you have to stop the loom then?—Yes, until I put French chalk on it.

660. And then you start up again?—Yes.

661. And with plenty of French chalk it works for a time?—Yes, just to make it slip over the shell.

662. (*Chairman.*) What sort of health do you enjoy yourself?—Well, in the damp weather I come out with sore legs, on account of the damp on the floor.

663. At what time of the year?—In the winter, especially.

664. What sort of health do you enjoy in the summer?—There are evenings when I come home when I have to change my shirt with the wet of it with sweat.

665. Perhaps on a very hot day you might have to do that if you were working outside, might you not?—Yes. I do not like to go out at all in the air after I do come home in the summer-time.

666. But in the summer-time you say that you have not good health?—I have good health, but not as good as it should be.

667. Do you feel particularly tired after your work in the summer?—Yes, and I have a headache in the summer-time.

668. Do you think that is due to the heat?—It is due to the heat right enough, but I have to stick it.

669. If you were working in a hayfield on a hot day do you think it would be the same?—No, for I could get air ventilation in the hayfield.

670. What is the difference?—In ——— shop there is not enough ventilation in it. At least I think there is not. That is my idea.

671. (*Professor Lorrain Smith.*) You go home and change?—Yes.

672. Are not you afraid to go out after you have changed?—No, not after I have changed,

673. (*Chairman.*) Can you suggest anything that the Government could recommend for making it more comfortable?—I think it is better with ventilators. The ventilators I think we have in the shop are not very good.

674. Supposing the Government said, "We want to prohibit the use of humidity when the wet bulb goes to a certain point," do you think that would be possible in your trade, to fix a point of that sort?—No. You could weave at a medium.

675. What would you call a medium?—From about 65° up to 72°.

676. Well, supposing they were to cut off steam at 72°, do you think you would still be able to weave?—Yes, and weave well.

677. Would not there be a great many breakages, and would not the work be much harder?—No, it would not.

678. You think not?—No. That is a medium heat.

679. (*Professor Petavel.*) So if they had to turn off all the steam in the shed, say, at midday on a hot day, you think you could go on working for the rest of the day without any steam?—You could not put it all off.

680. Yes, you could?—You could turn it off, but it would be damp enough on some days. If it was a damp day outside it would be damp enough to turn it all off.

681. I do not think you quite understand us. We mean supposing there was a rule made that all the steam had to be stopped in the shed, whether it was good for the weaving or not; what do you think would be the effect of that on certain days?—You could not weave with too little steam. That is the class of work I do.

682. What would occur supposing, ten days in the year, they had to stop steam altogether?—I could not say that.

683. It would make the work hard?—It would make the work hard, but it makes it harder if it is too damp.

684. Is there anything you would like to tell us that you have not said?—No, there is nothing. I have told all I have to say.

The witness withdrew.

Mr. J—— M—— called and examined.

685. (*Chairman.*) Are you a weaver?—Yes.

886. How long have you been a weaver?—Since December 1887.

687. What were you before that?—I went in the factory in 1887.

688. Had you done any work before that?—I worked at a hand-loom before that.

689. (*Mr. Ewart.*) You learned it when you were a boy, I suppose?—Yes; and it got bad, and I went into the factory.

690. (*Chairman.*) What class of goods did you do when you were a hand-loom weaver?—Weaving rather fine work.

691. In the factory where you work now you have steaming or artificial humidity?—Yes.

692. (*Professor Lorrain Smith.*) What is the name of your factory?——

693. (*Chairman.*) When you were a hand-loom weaver you had nothing of that sort?—No.

694. (*Professor Petavel.*) Have you no steam at all with the hand-loom?—No, there was no cause for steam.

695. (*Mr. Ewart.*) Was it in your house?—Yes, in my own house.

696. (*Professor Lorrain Smith.*) No arrangement for damping at all?—No call for damp.

697. (*Mr. Ewart.*) How did you damp? Did you wet the floor?—You dressed your yarn with brushes.

698. Did you wet the floor?—Yes, in the summer-time; we dug the floor.

699. What sort of floor was there to your weaving room?—Earthen.

700. (*Chairman.*) And you got some moisture from the floor?—Yes, it was in the summer-time.

701. Then I take it moisture is necessary for fine weaving?—Yes, it takes a dampness for fine weaving.

702. Have you got any artificial moisture where you work now?—No.

703. That is artificial moisture?—Yes, steam. Sometimes it takes more for fine yarn.

704. But where you work now are they steam jets or do you get the moisture from water, or from what source?—From steam.

705. Are they steam jets?—Yes.

706. Is that necessary for good weaving?—Yes.

707. Can you have too much or can you have too little?—You can have too much.

708. When do you begin to have too much?—I mostly turn it off myself.

709. Can you turn it off yourself?—Yes.

710. For the whole shed or for yourself?—I can turn it off for myself and for three more.

711. (*Professor Lorrain Smith.*) The four looms?—Yes.

712. (*Professor Petavel.*) So whenever your workers think there is too much steam they just turn it off?—Yes. if it was too damp I would turn it off, and if it was a scorching day or a north wind with a black frost I would turn steam on.

713. They let you turn it on and off just as you like?—Yes

714 (*Professor Lorrain Smith.*) That is the rule throughout the factory?—Yes, that is the rule.

715. The workers look after themselves in that respect?—Yes.

716. (*Chairman.*) When do you think you get too much? At what height of the thermometer?—Well, I believe between 60° and 70° would be nearly right.

717. You understand there are two bulbs, the wet and dry bulbs. You know that. Have you ever looked at those?—No.

718. Then you cannot speak with any certainty as to what temperature you begin to think there is too much?—The temperature was mostly 85° and 80° last summer.

719. How did you arrive at that unless you looked at the thermometer?—Well, I have been going about in my shirt and drawers.

720. You mentioned it at 85°. Did you guess that?—No.

721. How did you know it was that?—I heard them saying it was 85°. I did not look.

722. Was that good for weaving?—No, it was not, because too much heat will not do for fine yarn.

723. What is about right for fine yarn, for good weaving?—Well, I believe about 75° or 80°—75°.

724. You think 75° is enough?—Yes.

725. Do you suffer any discomfort in the summer or in the winter in your shed?—I do not understand you.

726. Do you feel uncomfortable at your work in the winter or in the summer?—Yes.

727. You do?—Yes.

728 When is the most comfortable, the winter or the summer?—The winter.

729. But why is that?—Well, I could not say.

730. Has the heat or the cold got anything to do with it?—I believe it is the heat.

731. In the summer?—Yes.

732. But is it worse inside the factory than outside?—Oh, it is.

733. Supposing you had to work in a hayfield on a hot day, would you feel uncomfortable?—No, it would be right enough.

734. Do you think you would feel more uncomfortable in the factory?—Yes.

735. Why?—I suppose whenever the factory is at summer-heat I feel uncomfortable because my shirt is wet, and as soon as you go out you cool down at once.

736. But you think while you are in the factory it always remains wet?—It always remains wet, especially when you are taking off a cut and your head is down and you sweat more sometimes. You go down and rise up again. The sweat always runs from here and drops down off you.

737. You think that would not go on, say, outside in the hayfield, for instance?—No, it would not take so much effect outside.

738. You cannot explain that?—No.

739 But you say it is so?—Yes.

740. (*Professor Lorrain Smith.*) What do you complain of?—I have complained of the discomfort, like

741. You say the workers suffer from discomfort?—Yes.

742. What do you complain of? What complaint do they make?—In the work.

743. Yes?—The dampness.

744. But you have control of the steam in your mill?—Yes. Sometimes I go to the tenter and he turns off the steam, or if it is not convenient I turn it off myself.

745. But you are at liberty to turn it off as you please?—No, I would not be at liberty. The tenter would see me and I do not think he would like it.

746. I asked you before about that and you said it was a rule?—I do not believe the tenter would allow me to do it.

747. (*Professor Petavel.*) What would you suggest to make things better?—I do not understand you

748. (*Professor Lorrain Smith.*) What would you like done to make things more comfortable in the mill?—I would like a medium

749. Medium what?—Medium dampness.

750. How would you manage it?

751. (*Professor Petavel.*) Supposing you were an owner, what would you do?—I believe ventilating would do that.

The witness withdrew

Mr. R—— M—— called in and examined.

752. (*Chairman.*) What are you by trade?—A weaver.

753. And how long have you been a weaver?—About 18 months.

754. What were you before that?—An engine driver.

755. During those 18 months that you have worked as a weaver have you formed any opinion as to whether it is a healthy trade or not?—Well, I would almost think it was an unhealthy trade

756. For what reason?—Being confined so, and excessive heat and damp at times.

757. Excess of heat and damp. From what source does the damp come?—I attribute the damp to the steam that has to be forced into the place; and there is no way of getting it out only through those fans that they have erected.

758. You say it has to be forced into the place?—Yes

759. Why has it to be forced into the place?—Well, they tell me that the yarn will not weave without it.

760. Do you consider you can have too much or too little steam?—Yes, there can be too much and there can be too little at times.

761. Can you tell us when there is too much and when there is too little?—Well, I can hardly answer that question. You see it is just this way. The tenter comes in and he just put the steam on as he likes, whether he knows what steam you want or whether he does not; and perhaps all the weavers do not know exactly as to what steam they do want. The consequence is there is perhaps at many times too much steam—more steam than is requisite.

762. But who should decide that? It is impossible for every weaver to decide when there is too much and when there is too little. Who is the right person to decide?—Well, I should say the employer should be the right person to see after such like, or employ someone to really see after such like.

763. The tender turns it on and off?—Yes.

764. Presumably he is appointed by the employer to do that work?—Yes.

765. And I suppose he does it to the best of his judgment?—Yes, I should say so.

766. Do you think he ever turns on too much?—Many a time.

767. Why should he do that?—Well, simply because he has to turn it on. It is a question as to whether he really understands whether it is really necessary or not.

768. He of course wants to get good weaving, does he not?—Yes.

769. And you want to get good weaving?—Yes.

770. You want good wages?—Yes.

771. Then he presumably will turn on what he thinks will produce good weaving?—Yes, just so.

772. Is there any reason why he should turn on too much?—Not a bit as I know of. I do not suppose he would do such a thing if he knew it.

773. You told us just now you sometimes got too much?—Yes, that is so.

774 When is that? Can you explain when it is you get too much?—We get too much in this way. It is not regulated during the day. It is just turned on in the morning at 6 o'clock, and it is not turned off until a quarter to 6 at night.

775. Do you think the tenter does not watch the thermometers and alter them according to the state of the atmosphere?—Certainly not, no.

776. If you have too much what is the effect on the weaving?—Well, it many a time makes the yarn towy and makes it break out.

777. What do you do then?—Tie all the ends in as best we can—piecing together.

778. But the more steam the less piecing there would be, would there not?—No, if there is too much steam it makes it towy and cloggy.

779. And you say there is more piecing if there is too much steam?—Yes; and again there is a lot of piecing if there is too little steam; you cannot work without moisture.

780. There is more piecing if it is too little or too much?—Yes.

781. Can you tell us about what temperature is right for good weaving?—Well, as far as I know about 65° up to 70°. From 65° or 68° dry and 65° damp would just be about right, as far as I know, for weaving purposes.

782. (*Professor Petavel.*) Can that always be obtained in summer? Does not the shed get hotter than that in summer?—Very hot in summer. I attribute that to the glass top.

783. How would you prevent the shed getting hot? You see 65° and 68° are temperatures that it would be difficult to obtain. It may be hotter than that outside in the summer?—Yes.

784. How would you keep the shed as cool as that?—Well, I hardly know, unless there is some way of making ventilation better than it is at the present time. Those fans do not do it properly as it ought to be done, I took particular notice for two or three days this summer. Of course this has been an exceptional summer; it has been very cool; but I have taken particular notice, and on two or three days we were 87° and 89°.

785. What shed are you working in?— ———.

786 That is cambric, I suppose?—Yes, linen.

787–8. It is fine linen?—Yes, fine and coarse.

789. In the same shed?—Yes, it is from 10^{os} weave up to 23^{os} and 24^{os} or so, or 25^{os} perhaps. When the heat gets oppressive the stench is bad, people spitting, and that sort of thing; and the floors are not really kept as clean as they ought to be.

790. There are more impurities in the air?—Yes.

The witness withdrew.

THIRD DAY.

Monday, September 16th, 1912.

At Belfast.

PRESENT:

COMMANDER SIR HAMILTON FREER-SMITH, R.N., C.S.I. (*Chairman*).

Mr. HENRY CUMMINS.
Mr. HERBERT EWART.
Professor J. E. PETAVEL, F.R.S.
Professor J. LORRAIN SMITH, F.R.S.
Mr. D. R. WILSON (*Secretary*)

Dr. JAMES ALEXANDER LINDSAY, M.B., F.R.C.P., called and examined.

791. (*Chairman.*) I think you are Professor of Medicine, Queen's University, Belfast?—Yes.

792 Have you been a professor for many years?—Yes, 13 years.

793. And I think you have had a long experience of hospital work in Belfast?—Yes, more than 20 years.

794. And I take it you have had opportunities from time to time of judging as to the conditions of labour in flax spinning and weaving?—I have, yes.

795. Have you read the report of the late Committee on Humidity in Cotton Weaving Sheds?—No, I have not

796. I should perhaps explain to you that particular attention was given to the question of working in hot humid atmospheres, and incidentally the question of the standard of carbonic acid came in. The body temperatures of a large number of people actually working in humid cotton cloth factories were taken by medical men, and the general conclusion arrived at was that inconvenience to the workers began, I think, at about 73° wet bulb, and that there was injury to health after 75°. Well, of course, we know that, necessarily perhaps, in flax spinning and weaving in Belfast, very high wet bulb temperatures are reached. I take it that body temperatures will also be taken for this Committee in hot weather by experienced observers, at a later stage, which will, perhaps, go to confirm the conclusions arrived at in the cotton trade Our principal object now is to know the effect on the health on the workers in flax spinning and linen weaving, chiefly in regard to the temperatures and moisture, and also to find out if it is possible—as has now become law in the cotton cloth factories—that at certain temperatures artificial humidifying should cease. Of course, we are now absolutely at the beginning of our inquiries; we have open minds, and no conclusion has been yet arrived at. I have before me the evidence you were good enough to give before the Industrial Diseases Committee on the 25th February 1907, and a great deal of that, I notice, refers to the question of dust in the preparation of flax?—That was the main question put before me.

797. That was the main question, I know. Although practically it does not come strictly within our inquiry, I shall be glad to have your opinion. You are probably aware that since then the manufacturers have done a very great deal in the way of better exhaust ventilation, collecting dust at the point of origin, and so on. A great deal has been done with a view to benefiting the health of the workers. Have you, since 1907, been able to arrive at any conclusion as to whether these efforts have produced good results?—I have no comparative figures, but I would like to say that in preparation for that former Committee I inspected a great

many of the mills in Belfast, and really my impression was that the precautions taken in the better mills were extremely good. I was agreeably surprised to find them as efficient as they were

798 That was in 1907?—Yes. I cannot say what progress has been made in the meantime, but the impression left on my mind was that the need was to bring the inferior establishments up to the level of the superior.

799. Might I ask if you have had any opportunity since of seeing whether that object has been achieved?—No, I have not. I made a tour of inspection in connection with the former inquiry. It does not lie in my line of work exactly; it was voluntary work on my part

800. Could you form any opinion, judging from the patients you get, as to whether the respiratory diseases likely to be caused by dust have diminished of late years?—I have not the figures regarding the trade in recent years, but, taking the town as a whole, the improvement in the last five or ten years has been most marked.

801. Probably you have no statistics to show how far this general improvement applies to mill workers?—No, but I should say there is no doubt in my mind that it does apply, though I cannot tell you to what proportion I would like to say, if you would allow me just to explain a point, that this whole question from your special point of view involves a difficulty to me as a medical witness. I look at the question from the point of view of the patient rather than from the point of view of the factory, and I ask the question: how does it come about that you get these figures at the hospital; what is the cause, for example, of this large proportion of bronchitis and gastric ulcer? I think there are probably four factors. There is the condition of the factories; there is this question of careless exposure of the workers to night air and the morning air, and questions such as insufficient clothing. That is a matter that lies within the competence of the workers themselves, and probably is a factor of considerable importance. Then, thirdly, the very important question of diet. It is not your immediate point of view, of course.

802. On the question of diet, I remember many years ago the late Dr. Purdon laid great emphasis on the question of tea drinking?—Yes, and white bread.

803. And he thought a large amount of anæmia was produced amongst the workers from excessive tea drinking?—A large proportion of gastric ulcer comes out in these figures, quite out of proportion to what it should be. Then the fourth factor is the housing of the workers. There are those four factors—the conditions of labour, careless exposure, improper diet, and imperfect housing—and I think, looking at the question from the medical point of view, or from the hospital point of view, to disentangle those four things is a matter I could not undertake to do.

804. (*Professor Petavel.*) Do you consider they are about of equal importance?—No, I do not.

805. Would the factory element be much greater or of much less importance than the others?—I should not put it in the first rank.

806. (*Mr. Ewart.*) Is it fair to ask what you would put in the first rank?—Well, housing and diet I label together as probably the two important factors. I should be in doubt which was the more important of the two.

807. (*Chairman.*) Coming to spinning rooms ——

808. (*Professor Lorrain Smith*.) Before we leave that point might I ask, what is the general health, or general standard of health, perhaps, of the people who are engaged in the spinning and weaving? Would they be a strong, healthy set of people?—You mean are they recruited from that class?

809. Yes, or are they recruited from people less healthy?—I should rather think the former.

810. One might almost say there is a certain lack of vigour in that set of people to begin with?—Well, I do not know that I could endorse that. No, I should say they are selected from a fairly good class.

811. I see They are a good class of the community, the spinners and weavers?—But not a specially good class.

812. (*Professor Petavel.*) So any debility they show when engaged in the trade would be due to the influence of the trade itself and not to heredity?—No, but you must include the three factors I mentioned.

813. Yes, I mean the general conditions of life of the weavers?—My conviction is that a good deal of the ill-health of the operatives is their own fault; that is to say, it is not a necessary result.

814. (*Professor Lorrain Smith.*) These diet and housing conditions are common to that class of the community?—They are.

815. (*Mr. Ewart.*) I think the last 30 years or so the recruiting of these ranks has been done largely from the country?—It has largely, from rather a good class, I think, physically.

816. That seems to be periodical. When there is a wave of depression over the country they flock into the towns, and at other times the recruiting is done from the town?—I should say in Belfast at present there are a good many country people, but we have not accurate figures. It is only an impression.

817. (*Professor Petavel.*) You do not think there is any selection of the weaker for the weaving trade?—I do not.

818. If a man comes in from the country strong and able-bodied, do not you consider there might be some tendency to become a mechanic or enter one of the trades where more physical force or mental activity is necessary?—Really I do not think my opinion on that would be of much worth. It is a matter I have given no attention to; but I may say, broadly speaking, I have not the impression that the weavers are selected from a class that is physically unfit.

819. (*Chairman.*) Now coming to the spinning rooms. Doubtless you have seen many spinning rooms?—Yes.

820. And you understand the conditions under which the people work?—I do.

821. I take it you agree that they work in hot and humid atmospheres?—Certainly.

822. And that of necessity perhaps their clothing is very wet?—Certainly.

823. I suppose both from condensation and from the sprinkling from the flyers?—Yes.

824. You know what splash-boards are?—Yes.

825. Where splash-boards are not provided the law requires that some waterproof covering shall be worn to protect the workers?—Yes

826. And there is a requirement that not only shall the protection be below the waist, but it shall cover the chest and the upper part of the body?—Yes.

827. Have you, from observation, been able to say whether that regulation is carried out?—Well, I have no reason to answer that in the negative, but my experience is not large enough for me to say definitely.

828. I put it to you this way. Assuming that the requirement to wear some protection over the chest is not carried out, do you think such omission might be injurious or lead to injuries to the workers?—On the whole, yes; but the degree of that injury I think might be a question.

829. Again, assuming that the people leave the factory for breakfast, for dinner, and again in the evening, say in winter, with wet clothing on their chests, to go home, might we suppose that that would lead to injury?—Certainly. I think that is the main point. I think it is the prolonged exposure to rather warm and damp atmospheres, and the sudden chilling of the surface of the body in the winter air—and there is often carelessness about clothing—where the mischief comes in mainly.

830. (*Professor Lorrain Smith.*) They complain also of being tired at the end of the day?—Yes, I am sure of that.

831. That would add to it?—Yes, certainly.

832. (*Chairman.*) Probably you can give us no information on the technical matter as to what temperature is actually necessary?—I have only given that most casual attention, and my opinion would be of no value. I would like to draw your attention to

one point. If you look at the second page of Table B,* Royal Victoria Hospital, I would like to say I began that inquiry with a strong conviction that spinners would figure very badly in the list, and the evidence did not seem to support that view. The proportion of phthisis there is nothing very excessive.

833. This covers how long?—I think the dates are given there. Those figures are representative. I do not think any other year would show anything essentially different. I quite expected the spinners would come out worse than they do.

834. (*Professor Petavel.*) Is not it necessary to know in this table the proportion that the total number of flax workers bears to the total number of cases investigated?—Is that not given?

835. The table shows that about one quarter of the cases of phthisis are spinners. Now what is the proportion of spinners in the total number of cases investigated?—The total number of cases of phthisis amongst all occupations was 227, and flax spinners were 50.

836. Yes, but supposing, for instance, only 50 flax workers came under your notice, it would mean that every flax worker had phthisis. We want the total number of cases both for spinners and for all trades that have been investigated.

837. (*Professor Lorrain Smith.*) How many flax-workers were there amongst the 227?—Fifty. That is given here. It is only a phthisis table. It only refers to the one disease.

838. (*Professor Petavel.*) Quite so, but there are 30,000 flax-workers in Belfast compared with a total population of 350,000. You must come back to something of that kind?—Certainly. That is only one bit of evidence.

839. Yes, otherwise you cannot judge?—I merely draw your attention to that table.

840. (*Professor Lorrain Smith.*) It is comparing spinners with other people working in the mills?—Yes. I thought the spinners would show up as one of the worst classes. It shows that an impression might be erroneous.

841. (*Chairman.*) I am referring now to your evidence given in 1907. I notice that it says: "Taking the "spinners, what do you think is the prevalence of "phthisis amongst them?" and the answer is "It is "high. The prevalence of phthisis is high." Would you like to say anything with regard to that, with subsequent experience?—Well, I merely want to point out that it is high, that is, compared with the general population, but they do not show so badly compared with other workers as I thought they would.

842. (*Mr. Ewart.*) Included in this number could you recall whether any of the patients came from other parts than Belfast district—the outlying parts, Whiteabbey, or Lisburn. Belfast hospital is not limited?—No, they are not necessarily all Belfast workers. I did not go into the question of actual residence. Those tables were based upon occupation.

843. (*Professor Petavel.*) I should like to know whether the conclusion which I draw more or less vaguely from this would be warranted. Apparently the population in Belfast is something like 350,000, so they are one-tenth of the population?—Not the weavers.

844. The flax workers. On the other hand, they form nearly one quarter of the cases of phthisis. From that, I should conclude that the flax worker was more subject to phthisis than any other worker. Would that be correct?—Yes. Bear in mind the hospitals are for the accommodation of that class. We do not get all classes in the same ratio at the hospitals. It would not be fair to take that basis. A hospital draws its patients from the operative classes almost entirely.

845. You would be naturally restricted to the operative classes?—You would have to exclude a class above a certain level that do not come to hospitals at all.

846. (*Professor Lorrain Smith.*) Do you think that would explain the difference?—No, I do not think anyone could argue that the operatives have the average health of the community. I do not think that could be maintained.

847. It seems rather to point to the flax worker being liable to phthisis?—It does, but I think if you look closer at the figures they are not so bad as possibly one might expect.

848. No, I agree?—Before you just leave that point, I might say the Irish tubercular rate is high everywhere. There is a great deal of controversy why that is so. At Dublin, where there are no factories, it is higher than Belfast. The Cork rate is higher than Belfast. We are face to face in Ireland with a high rate of tubercular everywhere.

849. (*Mr. Ewart.*) I think I am right in saying the highest tubercular spots are in the country?—I do not think that is so. Take a place like Cork. The rate is about the highest, but the country rate is high.

850. (*Chairman.*) Do you think that might to some extent be accounted for by the fact (though possibly it is not a fact) that the standard of living amongst the people working in mills is much better, that they get much better nourishment and much better food than probably the poorer classes?—I think that is quite so. I think the causes are probably three: bad housing, insufficient diet, and to some extent emigration, as leaving behind the less fit people to carry on the stock. I believe those are the three factors, and of course one could not say very easily which was the most important. You see my point. Before you conclude that the factories have a high tubercular rate, you have to remember that the rate in Ireland is everywhere high. Of course, it is a well-known thing that the tubercular rate in Ireland amongst women of a certain age is unduly high; that is to say, the age ratio in Ireland differs from that of England.

851. Speaking of tuberculosis produced by dust, is that correct, or should it be fibrosis?—Fibrosis is a feature of tuberculosis. It is a condition of lung often found in tubercular people.

852. I do not presume to speak; I am only asking for information on the medical question; but I have had it explained to me in other inquiries that the effect on the lungs from dust—especially hard dust like steel dust or stone dust—is to produce fibrosis?—I think that view is rather obsolete. In other words, where you get the lungs what we call fibrosed, that is an element. These cases are nearly all tubercular—possibly all.

853. I am now quoting from the evidence given by you before the Departmental Committee on Industrial Diseases.—

> "Q. 7318. Taking the spinners, what do you think is the prevalence of phthisis among them?—It is high."
>
> "Q. 7350. This is dealing with general diseases?—No. We regard spinners as the least healthy class."

Now in regard to spinners being the least healthy class?—Let me explain a moment. When I made the remark that spinners came out rather better than I anticipated, that was referring only to phthisis. For example, if you inquire into the amount of gastric ulcer amongst spinners, you find it very high, but the explanation is mainly dietetic, or at least largely dietetic.

854. That seems to finish your evidence before that Committee. Before we leave the question of spinning rooms, probably you will tell us much better than I could suggest them any points that strike you in regard to the health of the workers in such places, or anything that might be done to improve their condition, from the point of view of either comfort or health?—Well, I have a suggestion to make, though it might sound rather a preposterous one, and that is, if it were possible to introduce a principle of compulsorily cooling of the workers before they were allowed to face the chilly air outside.

855. (*Mr. Ewart.*) As in the Turkish bath?—The Turkish bath principle.

856. (*Chairman.*) Do you think that would apply if the workers worked in a dry temperature, even much exceeding anything we get in the flax-spinning room—that that cooling process would be equally necessary?—Well, it would be necessary, I think. I would also like to say I think a great deal can be done in the way of the education of the workers. I do not think these

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* See Appendix A.

points that are commonplace to us are at all appreciated by the workers generally, that is to say, the danger of chill, the danger of insufficient clothing, and the danger of damp Then you come on to the question of diet. I believe a great deal of work is being done in that matter with some success I think it would tell if the workers could be instructed on some half a dozen elementary points. They have it a great deal in their own hands.

857. In fact, probably there are many philanthropists who are doing good work amongst the people, and who, with a little primary instruction, might be lecturers and instruct the workers on points such as you suggest?—Yes, it is being done to some extent I would lay great stress upon that. The precautions are comparatively simple and practical, I think.

858. (*Mr. Ewart.*) Have you taken any interest in the dining-rooms established at a great number of the works through the town?—I have no special knowledge of that.

859. You have never inspected any of them?—I know a little about them, but I do not know much. I believe they are very good.

860. (*Chairman.*) Now, in regard to weaving, doubtless you know generally the conditions prevailing in weaving sheds?—Yes.

861. And there are some sheds, I take it, where artificial humidity is unnecessary, others where a certain amount is necessary, and others where it is asserted in this district that the wet and dry bulb thermometers must always be 2 degrees apart?—Yes.

862. Two degrees apart, of course, means something approximating saturation?—Yes.

863. Have you been able to form any opinion in regard to the effect or even the probable effect upon the workers who work in high temperatures, with a difference only of 2 degrees between the thermometers. By high temperatures we might put it perhaps from 75° up to 85° even?—There again I have to distinguish how much is due to mere exposure for a certain number of hours daily to the high temperature; how much is inseparable from the trade conditions, and how much is due to the want of reasonable precautions on the part of the workers afterwards. The human body has an extraordinary capacity for adaptation, and my own belief is that if certain rather simple precautions could be universally enforced the damage from such trades as you are considering would not be very serious. On the other hand, you must take human nature at what it is.

864. Certain precautions—could you in general terms suggest any of those precautions that might be taken?—Well, such points as we were discussing a few moments ago—to avoid the abrupt passage from a temperature of 80° or over to one of 40° outside perhaps, and the adoption of some additional clothing

865. Additional?—Additional.

866. Not at work?—Additional clothing.

867. But not to be worn at work?—No, on leaving work.

868. (*Professor Petavel.*) Do you think a change of clothing would be a practical thing?—Very desirable, but I question if it could be enforced.

869 (*Professor Lorrain Smith.*) But, generally speaking, you cannot point to any specific effect which you can ascribe strictly to the effect of a high humid temperature?—If you use the word "specific" strictly, no.

870. Quite. The general effects on the health at most which are due probably to a group of conditions?—Yes.

871. They complain of being very tired and having no appetite, and so on, quite apart from the danger of exposure, which they seem pretty often to recognise?—I am afraid that is to some extent inevitable.

872. But how far do you think that is harmful?—Well, I think we cannot get over the fact that a long day's work in a high temperature will to some people depress their vital energies to a certain extent.

873. So does hard work of any kind?—Yes, certainly There will have to be a process of weeding out I suppose.

874. (*Chairman.*) The other day a witness described a feeling of lassitude and feeling very tired, and want of appetite after leaving work. We put it to him this way. Supposing you had worked last summer in a hayfield, with a temperature perhaps during a portion of the day up to 85° or 90°, do you think you would have had the same feeling? He said, no, he would not have had the same feeling If I could put it in the form of a question · in the hayfield you would have air circulating, you would have free perspiration, the air outside would not be near saturation, whereas in the shed there is no air circulating, and the natural perspiration from the body is arrested, from the fact that the atmosphere will take up no more humidity from the body. Are not the conditions entirely different with the outside worker and the inside worker?—Well, I can assure you my own experience is this, that in the better class mills the air is surprisingly good in the sheds. It is warm and damp, but as for being foul, I should be inclined to deny that.

875. I do not suggest it is foul. I do not think I said that, because we have a standard of ventilation which prevents it being foul; the CO_2 standard has to be maintained, but, as I say—and I think it is beyond dispute—inside the shed the air is not circulating as it is outside, and that the air is within 2 degrees of saturation. I put it as a question, whether that would not prevent free perspiration from the body which would take place much more freely outside?—Well, yes, I think one would have to admit that.

878. Then I think we can hardly compare the outside worker with the inside?—No, the condition certainly presents some points of contrast, but if they are fatigued at the end of the day's work, and have not much desire for food, I cannot myself think that is important evidence. You get that sort of experience in so many different conditions.

877. (*Professor Lorrain Smith.*) They complain a good deal of rheumatism?—Yes. Well, we have a great deal of that here too.

878. I see you have 14 out of 70 Out of 70 cases of rheumatism, 14 of them were flax workers?—That is a moderate proportion, you see.

879. Yes, 20 per cent. of the cases?—Yes.

880 Of course, 10 per cent. of the cases of the total intern patients are flax workers. I do not know how that should be reckoned. The intern patients would include the surgical cases as well as the medical?—They do.

881. Only I see the flax workers are divided equally between surgical and medical, so it is probably fair to say that of those who have suffered from rheumatism the ordinary average would be 10 per cent. That would be 7 out of 70, instead of 14?—It is not a fair deduction from the figures.

882. You see you have 10 per cent. of the total cases of flax workers. That is the first item you make out on this table?—Yes.

883. Then of the cases of rheumatism, if there was nothing peculiar or special, 10 per cent. ought to be flax workers?—Yes.

884. Whereas we find 20 per cent.?—Yes.

884*a*. That again confirms general conclusions that you must assume, I think, that the operatives are not up to the general health average?—I think we must draw that conclusion.

885. Do you think you could put the rheumatism to sudden exposure to cold?—Yes.

886. On the other hand, pleurisy and pneumonia are 66 and 89, which is almost exactly 10 per cent That is another case where you would expect exposure to have raised the figure?—Yes.

887. Would you not regard pleurisy and pneumonia as about as direct an index of exposure as that type of disease?—On the whole, I think, perhaps that view is obsolete. Twenty years ago I might have said yes, but we are doubtful about it now Some time ago I went through my pleurisy cases. I think I had 200 odd, and I got a history of the exposure in one-third of them. We are now under the influence of the bacteriological view very much.

888. Yes, but exposure helps?—Yes, but it is not just a simple matter of exposure. These figures are

not really sufficiently large to warrant very positive conclusions.

889 Taking bronchitis, again you have 25 per cent.?—There the question of dust comes in

890. Anæmia 20 per cent.?—Yes, that is very high.

891. It looks as if, if there is any specific effect, it is anæmia?—Yes.

892. (*Professor Petavel.*) Would that be diet, housing, or general conditions? That is the most marked feature on the table, and rather a curious one Could you give any opinion on the probable cause?—Yes. Take the spinners as a class. They are young women at a somewhat immature age, many of them. I think in the prolonged exposure to high temperatures in the damp air, carelessness afterwards as regards clothing, and very insufficient food, you have just the very factors likely to create anæmia. That is a very remarkable figure.

893. (*Professor Lorrain Smith.*) That is the most striking figure in the table, really?—Yes, it is.

894. It really points to a general effect rather than specific?—Yes, very much, I think.

895. (*Chairman.*) I do not know if there is anything you would like to suggest on the general questions?—Well, it is a matter that has not been raised, but I know it has come before you I would merely suggest caution in drawing conclusions between two sets of facts, namely, the immediate effects of high temperatures, that is to say, at the moment, and their ultimate effect, their cumulative effect. I think there is a very important distinction to be drawn between them.

896 (*Professor Petavel*) Could you explain that statement? Do you imply thereby the worker might feel extremely tired and exhausted without it having any permanent influence on his health afterwards?—My point is rather this, that temperatures that might cause no harm for one day or two days, or six days, or twenty days, might cause harm if you take a wider view. The mere fact that a certain temperature or amount of humidity does not at the moment affect the health of the operative is not an argument that it might not do so ultimately.

897 (*Professor Lorrain Smith.*) That was more or less the conclusion that we had before us in the cotton inquiry, and we really wanted you to tell us?—I should attach no importance to a few single observations.

898. (*Chairman.*) No, but assume those single observations show that the bodily temperature is raised appreciably under conditions of work, and that that continues from day to day and from year to year?—Yes, but my point is just the very reverse of that I say, if you can prove deleterious effects at the moment, that is a fact that cannot be disputed.

899. And, presumably, if you take the bodily temperature to-day at a certain temperature and under certain conditions, and you repeat the experiment to-morrow under similar conditions, you get the same results?—Certainly. My point was rather this: conditions that do not at the single moment or after days produce any serious effects might ultimately produce such effects.

The witness withdrew.

Mr. Arthur Thomas Herdman called and examined.

900. (*Chairman.*) I think you are President of the Power Loom Manufacturers' Association?—Past president, for the year 1910–11. Unfortunately, the president is away from home at the moment, and asked me to take his place for the time being.

901. Are you the owner of works?—The managing director of the Smithfield Weaving Company, Limited. I was asked on Saturday, about a quarter to 12, to give an idea of some of the technical terms in the trade.

902. Quite so?—I do not know whether these would be of any use to you or not (*producing samples*). I brought you over one or two of the different lines, as it were, of what we call our fine and coarse stuff. I do not know whether these would interest you or not.

903. Distinctly, yes?—This is what we refer to as fine shirting linen or collar linen. I have brought a piece of 20 hundred. I call it fine shirting or collar linen. If the Committee would care for it in the white state I could easily get a white sample.

(*Chairman.*) No, I think not.

904. (*Professor Petavel.*) A 20 hundred is 20 ends in ·37 inches. Is that right?—Absolutely nothing to do with it.

905. What is it?—It means that on 40 inches wide there are 40 hundred ends. In other words, the number of ends to the inch on that would really be 100 ends to the inch. That 20 hundred would mean that in each of those inches in the warp yarn there would be 100 ends.

906. That is contradictory to what we were told on Saturday. We were told that 20 hundreds was 20 hundred ends in ·37 inches, or 10 ends in ·185 inches?—But we are not talking about the weft. It has absolutely nothing to do with 37 inches. I am talking about the warp It is on the warp that we speak about 20 hundreds, 10 hundreds, and so on. If a man talks about 10 hundreds, or 15 hundreds or 20 hundreds, or 5 hundreds, he invariably speaks to you about the warp threads. Here is the way we would speak. We call this 20 by 19, because the 19 means that there are 38 hundred threads to the 37-inch yard of weft. It is really so frightfully complicated that I do not know what the best way to put it is. Take this here. Here is a 5 hundred, which in reality is just four times coarser than that; in this 5 hundred there is just exactly a quarter of the ends to the warp that there is in this 20 hundred I may say you have the absolute extremes in these. If one of you gentlemen comes to count this for yourself you can get the number of ends without any trouble, because if you take *this*, this is a quarter-inch glass, *that* is a half-inch glass. If you take it *this* way you will see it absolutely. If you count from that point *there* to *that* point you ought to get about 13 or 14 threads. That is 26 ends to the inch.

907. That is in the warp?—In the warp.

908. What do you call that?—We call that 5^{00}, to be correct. The exact number of ends you really should have there is 5·2.

909. Why is that a 5^{00}?—It is 5·2. You should have 26 there exactly.

910 Why is that a 5 hundred? 500 what?—It goes through what is called a 500 reed, or comb that divides the warp That means that on 40 inches there are 1,000 threads, for each of those splits in the reed contains two threads. Have I made myself clear?

911. In 40 inches there are 1,000 threads?—That is right

912. That does not yet explain why it is 500?—Then there are two to each, which would make 500 on the 40 inches. You have another machine here called a heddle. Through each of these there are 1,000 threads—through the heddle. Leave out the word "reed" for the moment. Then two of those ends that are through the heddle are brought through and put through this reed exactly in that form. Therefore that gives you 500 to your 40 inches.

913. Is that a 500 reed?—That is a 500 reed, and in fact when you are speaking of your warp threads it is invariably the reed you are speaking of.

914. (*Professor Lorrain Smith.*) Invariably double?—Invariably double. I hope I have made myself clear.

915. (*Professor Petavel.*) Yes, I think that is beginning to clear up?—I should have brought the whole thing with me. I am sorry I did not.

916. (*Chairman.*) These represent practically the whole trade?—Ah, well, I would not like to say that. I give you the two extremes of the plain linen trade. It is what we call plain, that is without any figuring;

without damask, or any design. I think you get pretty well the two extremes here.

917 Of the plain?—Of the plain.

918 You probably understand that one great object we have in having these before us is that by and by it might or it might not be necessary to make some regulations as to humidity. It might be possible to classify the different materials in some way and to say what is necessary for one may not be necessary for another I do not say that it is so, but it might be so, and we want to be in a position to consider it if the question arises?—Quite so.

919. (*Professor Lorrain Smith.*) Then the 40 inches is a constant figure?—40 inches is the north of Ireland standard.

920. (*Professor Petavel.*) That is only half the problem We now come down to the weft?—Yes.

921. That is where the 37 inches comes in?—Exactly.

922. Now let us have that. What is the 20 hundred? It is in the weft?—The 20 hundred in the weft. The number of threads, do you wish to know?

923. I do not know. We are told a certain linen is 20 hundred, or 10 hundred?—A man will have to qualify his statement by giving you how many shots of weft he has under the 37 inches glass In this case it is a 20 by 19, and therefore under the 37 inches glass (which I will explain to you in a moment) there should be 19 shots of weft.

924. (*Chairman.*) By a shot, do you mean a travel of the shuttle?—A travel of the shuttle across. I use the shop term.

925. (*Professor Petavel.*) You call that a 19 hundred weft?—No, we simply use the term 19 shots of weft under the 37 inches glass.

926. The travel of the shuttle one way?—The travel of the shuttle one way. A 37 inches glass means this. When you are working with the linen trade you must get out of your head at once the term "yard." We have no such thing as a yard in the linen trade; that is, in manufacturing our "yard" is 37 inches, and the reason of that was—have you heard yet?

927. No?—You have to go back to the old hand-loom days for that, where the stuff was measured by the weaver himself. He took his yard stick and he did this (*indicating*), and he put his thumb there, and the next time he measured it he threw that thumb in and he measured from that, which gave you the 37 inches which to-day is the standard yard of the linen trade. It is most complicated for us, because we have sometimes got to work to so many single yards wide, and we have to change our calculation from our 37 inches yard to the 36 inches yard. When I tell you there are 19 shots of weft, it means that under this 37 inches glass ——

928. That glass is ·185 inches wide?—Yes, that is about right.

929 Then it is counted up under that glass?—It is counted up under that glass. We had better stick entirely to our glass. It is no good talking about the ends to the inch.

930. (*Mr. Ewart.*) It is unusual. It only refers to (generally speaking) very coarse goods?—Quite so.

931. (*Professor Pstavel.*) So really that would be 38 hundred shots in the 37 inches length; but you do not worry about that?—No, because we do not recognise a 36 inches yard at all. We do not understand it.

932. You call that 19?—That is a 19 shot of weft —a 20 through a 20 hundred reed with 19 shots of weft.

933. (*Chairman.*) Perhaps you would just describe in your own language the different specimens?—I give you now a specimen of the ordinary Belfast make of fine shirtings, which is used for the fronts of shirts and collars such as this here, and your ordinary evening shirt. I then give you a sample of what I guarantee for you here as a fairly fine linen cambric lawn. This is a 17 hundred through a 17 hundred reed, with 17 shots of weft. It is fairly fine. It runs up as high in some cases as 23 hundreds, and that sort of thing; but that is fairly fine. Then I will show you that white. This is the stuff Mr. Cummins will understand. This is the great make. You may take Belfast and a few of the country districts as makers of the shirting linen, but I am sorry to say it is a dying industry for one thing and it is really more centred in Belfast than in Portadown. Really Portadown are essentially cambric makers, which is the term I used here, linen cambric. which is this fine stuff. When I speak of cambric, you might remember it is essentially handkerchiefs

934. (*Professor Petavel.*) This is finer than that?—Yes. and it is much heavier. There is no analogy between these. This is for one purpose and this for another.

935. There is another point with regard to this 20 hundreds. We have found out what that means, but it gives no indication of the fineness of the threads?—Absolutely none.

936. What additional information do you want to specify the goods—that 20, 19 is not enough?—I think it is as long as you specify shirting linen, because we have certain standards of what we call settings. That is, of the yarn that goes in to form this stuff we have certain standard settings that always go to make a 20 hundred, that invariably go to make a 17 hundred cambric.

937. Can you give us one sample of the distinction of the yarn?—Yes This, for instance, would be set out of 90's warp. Take an 18 hundred ——

938 But you have not given me the weft?—18 by 18. The setting of that will be 80's warp and 120's weft.

939. Those are the leas?—Those are the leas. That means a lea is a cut. That is the first thing to get into your head.

940. What is a cut?—A cut is 300 yards.

941. 300 yards to the pound?—Absolutely correct —exactly the same as you have your 840 in cotton. It was originally some old complicated Scotch hand-loom spinning they had started.

942. I understand that 300 yards of a yarn numbered 1 lea would weigh a pound. Is that correct?—Absolutely correct. Why I brought these and left all the other classes of goods to one side is because these are standard makes.

943. Quite so. In a specification if you said 20's, 19's, you would know all about it, because there would be certain conventions?—Absolutely correct. Then I will give you another specimen. That is in the bleached state in which it would reach you in the form of handkerchiefs. This is what we call a 17 by 17 bleached. I will give you the other extreme of cambric. I mark this coarse linen cambric lawn. I put it down coarse. It is a 12 hundred. I think that is fairly coarse.

944. (*Mr. Cummins.*) Yes, fairly coarse. Now this is a medium. Unfortunately, I am not in a position to give you one of the very fine ones, but some of the Portadown men will be able to give you a really dead fine cambric, that is, 20, 21, or 22 hundred. I have no specimen of that, but I do not know if you really want that.

945. (*Professor Petavel.*) But it does go up to 22?—23, I think. In fact, 24, but that is not worth talking about. They make it entirely on hand looms.

946. What is this figure?—That figure is simply the width in inches.

947. The warp figure is the first mentioned?—The warp figure is invariably the first mentioned. If you came to me you would say, I want a thousand pieces of 15 hundred, and that would be that figure there, You invariably speak of the warp thread, and then you may qualify it if you want to cut your cloth. If you are buying a 15 hundred with 16 shots of weft, if you want to cut your price you take a shot of weft off that, and make it 15 by 15, because the less weft we have to put on, the cheaper it is.

948. The first figure in the conventions of the trade usually defines the whole thing?—Invariably. There is another specimen here. Here is a specimen of coarse linen. It is used for the bodies of shirts, and for pillow slips, and for embroidery purposes. I think that pretty well covers it.

949. (*Chairman.*) What about sheets?—Well, I have no sheeting, unfortunately.

950. (*Professor Petavel.*) Are these cambrics?—No. Those two are cambrics which I have marked.

951. And these are shirtings?—Shirtings, and this is pillow linen. This is also a pillow linen—a fine pillow linen. There is the other extreme here. The technical term for this is a crash, which you and I would call a roller towel.

952. What is the figure?—7 by 7. That is exactly the same thing again—a 700 with 7 shots of weft under the 37-inch glass.

953. Do you know whether the sizes were purposely taken, so that the customary figures should come somewhere near each other, or is it accidental? I notice it is very often 14 by 14, or 12 by 12?—Just the first I came to. I told them to send me specimens from the shed, and these are the ones they sent.

954. (*Mr. Ewart.*) Take one class of goods, canvas ducks. 700 would run from 7 by 4½ to 7 by 10 or 10½?—Yes, but I cannot see how that interests these gentlemen.

955. (*Professor Petavel.*) Just for information?—You get a rough idea here of what you want.

956. Quite; that is very essential, because these numbers are continually mentioned in evidence, and we must form some idea as to what they are?—This here is another type of linen cambric. The technical term for it is "sheer." This is a much finer type. When I say finer, I mean a much lighter type. That is what a lady would call cambric, and they would call that ordinary handkerchief linen. That is much lighter. This is a 16 with only 14 shots in it. You will get plenty of evidence from the men in Portadown about the difficulty of making this type, because it is made out of much finer yarns than these that I showed you originally, although that is only through a 16 hundred reed, and the original was through a 17 hundred reed. That I should say would weigh 35 per cent. lighter in the weft. It is made out of much lighter yarn.

957. What would be the difference in the yarn in this and that?—That will be 90 and 140. 140 for the warp, and about 180 or 190 for the weft.

958. So the difficulty in this style of weave is the fineness of the threads?—Of course, it makes it more difficult to work, because you have a weaker thread.

959. On the other hand, you have a less tight weave?—No.

960. There is more space?—Yes, that is true, but that happens to be like this. That might well have been 16 by 16. The house I sent to sent me this as a specimen. This one is just a coarse form of dress linen. This is a 500 with only four and a half shots of weft. This is the very opposite extreme to what I showed you first. There are the two extremes. In the linen trade, I think I am right in stating, we seldom go below 5^{00}. There are some 4^{00}'s being made, but I think for ordinary purposes 5^{00}'s is the lowest set we go to. That is bleached. This is boiled.

961. (*Chairman.*) Did you say bleached?—Yes. It is a low type of yarn it is made of, which has that peculiar lumpy irregularity.

962. (*Mr. Ewart.*) But it is spun for that purpose?—Yes, it is done to get that frieze effect.

963. (*Professor Petavel.*) It gives a finer effect?—Yes.

964. (*Chairman.*) You are a power loom manufacturer?—I am.

965. And do you also do spinning?—No, purely weaving.

966. And no doubt you have had many years' experience as to the conditions in weaving factories?—I have a great number.

967. And you doubtless consider that artificial humidity is an essential to effective weaving?—I do.

968. Do you consider that necessary in all branches of the flax weaving trade?—I think it is a help in every branch.

969. Would the amount necessary vary according to the goods manufactured?—I should say it would.

970. Can you in general terms classify the goods requiring the most artificial humidity as compared with others requiring less?—I should say that the specimens I have shown you to-day, the fine shirtings, linens, and the cambrics of different types, require the most humidity, and a very high degree too.

971. And in regard to temperature, is that an essential element in regard to successful weaving?—We all say so. You must have both humidity and heat.

972. Then can you say approximately what you would consider, for the class of goods you describe, as the best weaving conditions? By best weaving conditions I mean as judged by the thermometers?—Do you wish the wet or the dry bulbs?

973. Well, we should want the wet and the dry, you see?—I just have a note of it here. Do you want summer or winter temperatures?

974. We would like it in both?—Well, I would say that in the summer time the wet bulb is anything between 75° and 80°. I have not a note of the dry here. I just took a note of the wet bulb.

975. And the dry bulb?—Well, I should say in that case there would be perhaps 2 degrees difference. My idea is to get as near saturation as you possibly can. That is my feeling.

976. That is from a weaving point of view?—From a weaving point of view; and why I say that, if I may qualify it, is that we invariably find the tenters, otherwise the foremen, tell us that their weavers constantly ask for more steam. I was talking on that very subject this morning, no later than two hours ago, and they say that two or three or four times a day the girls come to them and say "Turn more steam on."

977. Would that be, for instance, on a very hot summer day?—I had better tell you what one of the men described for me not long ago. I asked him that question about a hot summer day. "Well," he said, "I find that on a hot day if I turn the steam on and " get more moisture, that my body is freer and I feel " better." Now, that was his answer to me.

978. Then you think from 75° to 80° for the fine goods?—I am speaking entirely about the fine goods.

979. And can you say what might be necessary for other classes of goods?—For course goods I would think anything from 65° to 70°. I should say, off and on, about that.

980. Wet bulb temperature?—Yes, I am speaking all the time about the wet bulb temperature.

981. Now, you said that in your opinion, for the best weaving, something approximating saturation would be the best condition?—That is what I have always understood. We find the damper the shop the better the weaving conditions.

982. And, of course, as you know, it has been the law for many years, that the thermometers must not get closer than two degrees?—Yes, that is right, which we always aim at keeping.

983. And presumably your trade has gone on satisfactorily for these years under those conditions?—I think we have held the fine linen trade. It is one of the few things we have here.

984. Now, can you tell us why that limit of two degrees was laid down?—I cannot.

985. Can you say if, before the law was made, there were any actual experiments to see whether there might be efficient weaving with a greater difference between the thermometers?—I am trying to recollect. I cannot remember whether there were any experiments made in our own shop in those days. My recollection is our inquiry was the outcome of the Cotton Inquiry that had been held before that. That was my recollection of it, but that is only a recollection.

986. Assuming that working in temperatures above 75° wet bulb is injurious to health, it would naturally be desirable to reduce the temperature if the trade could go on satisfactorily?—Well, it could not.

987. That is what I am coming to, but if it could it would no doubt be desirable, would it not?—Well, on a broad principle it would.

988. Naturally the manufacturers would wish their operatives to work under the best possible conditions, consistently with carrying on their trade efficiently?—Yes, quite so, but I think you will find the greatest

opposition will come from the workers themselves about that.

989. Seeing we have before us no evidence as to actual experiments, do you not think that when we make our report it would be much more convincing and much more readily accepted by the authorities and by the public if we could get a certain number of manufacturers in typical sheds to try some actual experiments? I mean to turn off humidity at different readings of the wet bulb, to watch the effect on the spinning, to see how long the humidity in the shed lasted, and to count the number of breakages and the amount of piecing, and also, I would say, let the operatives express their opinions of these experiments; that if we had that before us we could certainly report with much greater confidence, and our report would carry much greater weight?—I think you will find that every manufacturer is willing to give you every help and facility that you require.

990. In regard to that, of course, I should have to trust to the manufacturers. We might suggest some detail as to the experiments, and we should have to ask the manufacturers if they would carry them out. My object now in asking you as the representative and ex-chairman of the power loom manufacturers, is whether we might address your body and ask them to carry out some experiments in this direction?—I think it would be very useful. I think we can get it done for you; but I understood that you would carry the experiments out with one of your representatives. At least, we hoped you would do that. If not, we would be glad to do it for you.

991. We have a memorandum from the association in which they say there has been no public agitation in the north of Ireland against the use of artificial humidity?—Yes.

992. Am I right in supposing that labour is very poorly organised in the north of Ireland?—In the case of the spinners and weavers, yes, I would say decidedly so.

993. That being so, perhaps it might be a little difficult for the workers to put on record their opinions in these matters?—We have never found that. If they have any grievance we generally hear about it at once.

994. In Lancashire there was a ballot of the operatives taken throughout the whole trade. There has been nothing of that sort taken in this country, I suppose?—No. If you give me the pleasure of a visit to our place you can ask the different girls yourself. That is the best thing to do.

995. Now to quote from the memorandum from the Power Loom Manufacturers' Association —"*With "reference to a letter of the Chairman of the Home "Office Committee addressed to the Association of the "26th July last, in which it was stated the more "important matters for investigation appeared to be the "following:—*

> "*In humid weaving sheds the temperatures, especially wet bulb temperatures, recorded, it is understood the Home Office is already in possession of all the necessary information*"?

—Yes, we took it you had all your records there and would turn them up.

996. "*As to whether mechanical or other means can "be adopted for the reducing of the temperature with "the object of obtaining the necessary relative humidity "at a lower temperature.*" Well, many suggestions as to the cooling of the sheds have been made, and, of course, the object of cooling is very important, because if you can reduce the temperature in the shed you get your relative humidity at a lower temperature. Up to the present we do not know very much as to what has been done in Ireland. For instance, in Lancashire the operatives say they work with much greater comfort where, instead of steam jets, water sprays are used. We should like some evidence as to whether that has been considered, and whether the spraying of roofs has been considered; whether the incoming air has been taken from a considerable distance from above the hot slates in summer, where the air would be cooler than close to the slates. All these methods we shall have to notice?—Well, our feeling about that was that in the blue book—I forget the number of the last report, but Professor Petavel's reports are all in—we saw diagram after diagram, and we thought the thing had been infinitely more closely gone into than the evidence we would give you on the subject. We have no data like that. You have absolutely scientific facts here, but you can only get from us our ideas.

997. We shall have to see whether all or any of these ideas have been tried over here. That I think we shall have to get by visiting, shall we not?—You will have to get a list of the names of the different people. I can tell you the names of the people who have the different types of humidity.

998. (*Professor Petavel.*) You have no personal experience of the comparative value of steam jets and a water spray system?—I have not. We were thinking of it at one time, and an engineer in Belfast, who considers he knows a great deal about this sort of thing, told me the best way to atomise water was by steam, and if you blow steam you get the finest atomisation of water, and, he said, do not change. We did not. We were greatly pressed at one time to put in one of Howarth's humidifiers, and we were greatly impressed, and under those circumstances we did not.

999. The question of CO_2, so far as we have heard from the inspectors and otherwise, seems to be working smoothly?—Yes. You see we all had to put in a certain number of ventilating fans, and since we have done that we have had no trouble.

1000. Originally the law required you to put in a certain number of fans and to change the air a certain number of times. Then that was followed by a CO_2 test, 9 parts in 10,000?—Yes.

1001. And so far we have no evidence that there has been any difficulty in maintaining that?—I have never heard of it. I never had any trouble about that.

1002. Is there anything you would like to tell us, or any suggestion you would like to make to the Committee, as to our methods of work or any things you think may have escaped our attention?—No. I believe greatly in you going to the different sheds and hearing the opinions of the operatives themselves. That is what I hold to more than anything else. I think you will find, if you go to the different sheds and ask the workers themselves what they think of the conditions, it is much better than getting my evidence.

1003. (*Professor Petavel.*) Might I ask your opinion on this point. Certain operatives have been here and gave us to understand that a good deal of trouble was caused, for instance, by an excessive amount of steaming above even what was good for the manufacture of the cloth, and attributed it, as far as I could make out from the evidence, to careless management of the steaming apparatus—carelessness on the part of the tenter, or whoever it is. Do you think that generally a great deal of harm is done in that way, through mere want of attention to the varying conditions of the weather from day to day?—Speaking of girls entirely, I think if a girl found her conditions uncomfortable she would go to her tenter and tell him that she wished the steam turned off, and if the tenter did not do it the management would hear of it in a very short space of time. From the manufacturer's point of view we do not wish to blow steam off, as you understand a great deal better than I do. You do not make steam for nothing, and our idea is to do with as little steam as we possibly can, conducive to the proper conditions of weaving. If you see your safety valve blowing, you go to your engineer and you ask him what the meaning of that is, what he is wasting the steam for. Why should I blow it into a factory and waste it there? That is my answer to that question.

1004. That shows that it is not profitable to the manufacturer to do it; but, on the other hand, we have evidence that for some reason or other it does occur very frequently, so much so that we were told, for instance, that special means had to be taken to prevent the threads sticking to the back shell?—Well, of course, again that may be in some exceedingly fine counts of yarn; but I cannot understand any weaver allowing his or her tenter to blow off more steam than would be right, for I have never yet seen the workers so very bashful that if the thing was wrong they did not let the management at once hear of it.

1005. (*Chairman.*) One question leads to another. We have been told that on account of the excessive moisture it is necessary from time to time to put chalk on the back beam to absorb some of the moisture?—I have seen that done, but if you come to us I will show you how the chalk is more used. It is when a loom is standing idle, which we have, as unfortunately our supply of labour to-day is not equal to the demand. We have always a certain number of looms standing idle, and I have seen them put chalk on simply to stop it rusting and sticking.

1006. Just one point more in regard to the preparation or size. Do you know whether any experiments have taken place in this district with a view to rendering, by different methods of sizing, less humidity possible?—But we do not size. All we want to do is to put the very finest, thinnest coating of dressing on, We do not want to do it. We could not put five per cent. of weight in if you paid us for it. We do not put size—simply a slight dressing to lay the hairs.

1007-8. You dress, but do not size?—Our thread will not take a size. The thing is impossible.

1009. We noticed in going through the sheds a sort of preparation which looks like soap, or something of that sort, and the warp passes over that. Is that with a view to giving it more elasticity, or making it softer?—The reason we do it is this: it is to put on a little, shall I use the term, varnish. Our dressing is simply putting on a little paste, if I may use the term. We generally dress with either sago flour or the purest wheat flour. We try to put the smallest quantity of dressing on we can. We put it on simply to lay the hair on the thread, because the bulk of our goods are bleached afterwards, and when you come to certain types of the low goods, we have to guarantee to the merchant that we have no sizing on them—have to guarantee that. We have to guarantee that they are run dry as the technical term is. As to the question of sizing having anything to do in the linen trade with the question of humidity, well, the thing is altogether wrong, because, as I say, what we want to do is to put the very smallest amount of size on we possibly can.

1010. (*Professor Petavel*) The question is rather this. Can you conceive of any chemical treatment of the thread before the beam is made up which would make less artificial humidity necessary?—I cannot, and I do not know how you would arrive at it, because, as I say, if we made our thread any stiffer than it is, it would make it break. If we were not allowed to put a little dressing on it would all fur up and we could not weave it. But get the idea of sizing out of your head entirely, because we do not want it.

1011. No, probably it is weight you are troubled about. Could the thread be treated by some chemical method, possibly with some hygroscopic substance so that less humidity would be necessary? I take it you consider that as a hopeless thing?—Absolutely. I have tried. Do not let me exaggerate. I certainly have tried dozens of different types of dressings, and you invariably come back to your sago or to your flour. We used to dress with what you would call Iceland moss, and we have even given that up. We simply keep to the two types. I understand in some places they still use this Irish or Iceland moss, but in other places the purest flour or sago flour.

1012. (*Chairman.*) Has any method of "local" humidification ever been tried in this district? By local humidification, I mean instead of the air being charged with moisture, the moisture is applied close to the warp?—No, it has not, and the way I would answer that is, I am afraid in making any application like that, the cost would be so frightful. I would be very much afraid of that. Please do not take that as evidence. It is only on the first blush of it.

1013. Have you seen, in the Report on Humidity in Cotton Weaving Sheds, the descriptions of methods of local humidification?—I am ashamed to say I did not notice that.

1014. I would ask you, please, if you would look at those. I do not for a moment say that it could be applied to your trade. Doubtless if anybody even thought of it, they would experiment very carefully before going to the enormous expense of change of method. But still many people think there are great possibilities in it, and I do not think there would be any harm for you to look at those specifications and descriptions?—Yes, I should think that would do with a good elastic fibre like cotton, but I am afraid it would not do with linen.

1015 (*Mr. Ewart*) In connection with Professor Petavel's question, have you any knowledge of experiments being made with mixing chemicals or glycerine with the dressing?—Yes.

1016. What was the result?—To soften the yarn.

1017. Did you ever hear of mildew being set up?—Well, I have only seen that on one or two occasions, and that is when the beam has been lying idle.

1018. Do you know, as a matter of fact, is linen yarn more susceptible to mildew than cotton?—That I could not answer.

1019. There is another question in reference to the evidence that has been given. Have you any reason to think that the wet bulb temperature between 65° and 72° gives better weaving than at any other part of the thermometer?—Certainly not. The Chairman asked me what I thought was the best condition, and I said 75°.

1020. (*Professor Lorrain Smith.*) I was going to ask if you have anything to add about winter temperature. When you told us about 75° or 80°, it was in reference to summer conditions?—Yes.

1021. You were interrupted; you did not give the winter temperature?—Well, because I told you I had not my winter temperature with me. I did not trouble about it. I had only June and July of the two years.

1022. Is there any modification of that figure? You gave us 75° to 80° wet bulb?—I cannot say whether it is winter or summer. You asked me what I think is the best condition, and I told you.

1023 You think it is the same for both?—It is more difficult to get it in winter.

1024 But if you could get it you would?—I would.

1025. All the year round?—All the year round.

1026 75° to 80°?—Yes.

1027. (*Mr. Ewart.*) I was going to ask another question. I am sure you know what managers and weavers call a bad weaving day?—I do.

1028. And a good weaving day?—I do.

1029. Is it possible to have the same temperature dry bulb and wet bulb, and the same difference between those temperatures on a bad weaving day as on a good weaving day, and yet the bad weaving continues?—Yes, it is.

1030. Have you heard an expression used during the past few years since these thermometers became fashionable that there was something in the weather that the thermometer did not find out?—Absolutely.

1031. That is a common saying?—Absolutely.

1032. A factory manager has no reliance on the observation of the wet and dry bulb temperatures to tell him what is wrong with the weather?—No, neither has the tenter.

1033. Or the tenter?—I was discussing that question this morning.

1034. I look upon them as deputy managers?—Quite so.

1035. That is, the management from first to last does not regard the difference between the wet and dry bulb thermometer as a rule as giving them a clue to that missing quantity which goes to make up what we call a bad weaving day?—Quite so; and if I may throw the hint out—which I think will be much more elaborated by some of the other men who know better than I do—personally I have always held there is some electrical condition. I may be entirely wrong, but I have always had that feeling.

1036. I was going to ask, have you ever heard that expression?—I have, but of course I go back to the time I was a spinner, and if you remember in the preparing room when we had a lick-up we invariably said that was electrical.

1037. Of course there you had the friction of the dry rollers?—You had, but you had the same thing: whatever the atmosphere was that lick-up took place. It would be a damp morning outside, and you had your lick-up, and we could not understand how it was.

1038. (*Professor Petavel.*) Would that be diminished by a change of the wet and dry bulbs. Supposing you had a good weaving day, would you consider that it would weave as well with four degrees difference as on a bad weaving day with two degrees difference between the bulbs?—No.

1039. Does it give you more latitude in that direction?—No. I do not think that at any time in what I call a fine shed you will ever get perfect weaving conditions with four degrees between the bulbs—never. I say you require the two things, both humidity and heat. I cannot, from the scientific point of view tell you why, but there is no question that the two go hand in hand. You require heat plus humidity.

1040. Plus something else?—Plus humidity.

1041. You say there is another factor?—No, the other factor that Mr. Ewart asked me about, the two bulbs standing exactly the same, and the one a so-called good weaving day and the other a bad weaving day—that I cannot explain.

1042. But you say it is very marked and very universal?—It is absolutely universal; we all know that

1043. It is not a difference in local conditions in the shed caused by a wind, for instance?—No Of course, if you have your draught it stands to reason if the draught is over your loom the yarn will break. I thought you were referring to identical conditions here.

1044. (*Mr. Ewart*) Yes. As regards that question of Professor Petavel's, does a bad weaving day occur on a day when there is no wind at all?—Yes, but not to the same extent.

1045. (*Professor Petavel.*) Usually an east wind or north-east?—Not necessarily, because we do not have the east wind very long, mostly in the spring time. Our prevailing wind is westerly, one of those hard west by north, or due west—those are the worst winds that hit us here. Of course, admittedly, the worst wind of the lot is the east wind, but we do not get much of it. Have I made myself clear?

(*Professor Petavel.*) Yes

The witness withdrew.

Dr. John Elder MacIlwaine, M.D., B.Sc., D.P.H., called and examined.

1046. (*Chairman.*) Will you kindly tell us the appointments you hold?—Visiting physician, Forster Green Hospital; assistant visiting physician at the Royal Victoria Hospital; and certifying surgeon to the North Belfast district.

1047. You hold the office of certifying surgeon?—Yes.

1048. How long have you held that office?—Since March 1906, about six years—a little over six years.

1049. In that capacity I have no doubt you have had several opportunities of seeing the workpeople, and, in a general way, of judging of their health and physique?—In a very general way, going through the rooms in the various factories and mills, but not spending a very long time in the rooms; merely a general look at the workpeople.

1050. Then your duties consist in examining the young people before they go into the building?—Yes.

1051. I think there is no subsequent examination, excepting under certain special rules?—Yes.

1052. Which do not apply to the flax trade?—Unless I think a child is put back for examination by the inspector. That is the only condition.

1053. Quite so, yes. In your capacity, as I think you said, of consulting physician to the two hospitals, have you been able to say whether you have any large number of patients from the spinning and weaving mills, or any particular department of them?—No, sir. From my general observation I have noted no special disease. I have had the figures made up for the Royal Victoria Hospital of intern patients for the past two years, and I do not think the figures show any marked incidence of disease in spinners or weavers.

1054. Intern, I suppose those are in-patients?—Yes, the patients in hospital. We keep a record of the occupations of the intern patients, but it is not always kept in the case of extern patients.

1055. You probably know that questions have arisen, especially of late years, as to the effect of working in hot humid atmospheres?—Yes.

1056. Do those conditions exist in Belfast?—Yes, in the wet spinning rooms and in the humid weaving sheds those conditions exist.

1057. (*Professor Lorrain Smith.*) Have you got the figures for the two years?—Yes, I have.*

1058. Would you perhaps give them?—I think the Chairman has a copy.

1059. (*Chairman.*) The diseases treated appear to be bronchitis, pleurisy and pneumonia, cardiac, kidney, gastric ulcer, anæmia, rheumatism, and also phthisis?—The figures for phthisis are taken from the Forster Green Hospital annual report, and also from the public health officer's report, the notifications for the last two years, the corresponding period to the figures I have given for the Royal cases.

1060. (*Mr. Ewart.*) I think I am right in saying the Royal does not treat phthisis internally as a rule?—Yes.

1061. There must be something else with it?—Yes, and sometimes if a case is taken out an urgent case of phthisis may be taken in. If I might make a remark on this table, it is with regard to phthisis, which in the figures I have given seems to occur rather frequently amongst wet spinners. The wet spinners, I think, if one might say so, are probably the poorest operatives, and one would naturally expect that there would be more phthisis on account of their home and general conditions.

1062. (*Chairman.*) By "poorest" you mean receiving the least wages?—Well, I could not be quite certain about the wages, but I think the spinners, taking them as a class of operatives, probably are not so well off in their homes as the weavers. Mr. Ewart might be able to say if that is right. That is the general impression I got from the workpeople.

1063. (*Professor Lorrain Smith.*) You have not worked these out as percentages of the total?—No.

1064. It might be worth while doing that?—It did not seem as if the figures were quite large enough, and they do not seem to throw any great light upon the subject.

1065. But if you got the total number of cases and the total number of workers in mills ——?—Unfortunately, we were not able to get that. I do not think you can get the number of weavers and spinners. I do not think any list exists of the numbers.

1066. You get the total number of intern cases?—I have given the total number at the top. You mean the total of all classes of patients admitted to the hospital?

1067. Yes?—The figures at the top of that represent the total of bronchitic cases, 20 in two years; of pleurisy and pneumonia in the hospital, 167 in that period of two years—that is the total of all trades and occupations, and the cardiac, 358, &c

1068. That is, a certain percentage of the total cases admitted were bronchitis, cardiac, and so forth?—Yes.

1069. Was that percentage in any given disease higher for those who came from spinning mills and weaving factories?—I did not make that out.

1070. According to the tables that we have had before us, there are roughly 350,000 people in Belfast, and about 35,000 employed in the linen industry, that is to say, 10 per cent.?—Yes.

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* Appendix B.

1071. Then you have, say, 120 cases of bronchitis?—120 in the general public.

1072. More than 10 per cent of that from the mills, perhaps, or less?—You would have less than 5 per cent. amongst spinners.

1073–5. But from the mills, as a whole, there would be in all who are employed 35,000?—I do not know the number of spinners.

(*Mr. Wilson.*) I can give the approximate number of the spinners from the Home Office returns.

(*Professor Lorrain Smith.*) We need not delay for that. That can be worked out.

1076. (*Chairman.*) At any rate, that paper is handed in. I think you made some inquiry into the health of the people engaged in spinning?—I examined 100 children and young people. I examined them pretty fully as on the lines of a life assurance examination. I did it with the object of ascertaining what was the health of the child. These children had all been passed by me as a certifying surgeon, and I wished to ascertain what their exact condition of health was.

1077. One moment, please. You examined 100 children and young persons. Those were taken from different mills?—From two mills, 50 from each mill.

1078. And what were the approximate ages of these people, and how long had they worked at their occupation?—There were 22 children between the age of 12 and 13; 31 between the age of 13 and 14, 42 between the age of 14 and 15, and 9 between the age of 15 and 16.

1079. And, of course, their period of employment would vary?—It dates practically in almost every case from shortly after they were 12.

1080. We may take it, speaking generally, that they had worked from the age of 12?—Yes.

1081. And from 12 to 14 they would be on half-time I take it?—Yes.

1082. The law has somewhat changed since I had to do with it?—They may, with a school certificate, go to full time at 13.

1083. That is still the law?—Yes.

1084. You said you examined them on the same lines as you would for life insurance?—Yes.

1085. And what was the result of your examination? Of course, you cannot say individually, but what were the general conclusions you arrived at?—That the children were healthy. I found three cases of organic disease, two cases of heart trouble, which were fully compensated, and one case of kidney disease, amongst the 100, which I thought was a very low percentage of organic disease.

1086. Were you able to extend your examination to adults?—No. I did it with the idea of determining the health of the children I was passing.

1087. But you have had no examination of adults or people who have worked for a considerable time in the spinning mills?—No, not except in the general course of my work at the hospitals. I have done no special work on the diseases in the various trades.

1088. (*Professor Lorrain Smith.*) Have you compared the results of these 100 children with the school hygiene results—This was done some time ago, and Miss Martindale, who conducted the examination with me from the point of view of the home conditions of the children, made some comparisons. Unfortunately, I have been unable to lay my hands upon the papers that she read, but it was found that the weight of the children and the height of the children was somewhat below a standard which she had obtained for these ages, but otherwise I have not compared it with any figures.

(*Chairman.*) Miss Martindale is to give evidence.

1089. (*Professor Lorrain Smith.*) Yes, it was just on the question we were raising this morning as to whether the children who get employed were up to the average standard of vigour and health?—Well, I think they are.

(*Chairman.*) We will get that from Miss Martindale perhaps.

1090. (*Professor Petavel.*) And they maintain it, they do not degenerate after years of employment? Do they enter up to that standard or do they enter the trade weaker than the standard of the general population and remain weaker?—I should think they enter about the standard. I could not say whether they fall below the standard of the general population. It would only be the expression of a mere opinion.

1091. (*Chairman.*) I think the general conclusion you arrived at, based on the statistics of diseases amongst the mill and factory workers for the past two years for the Royal Victoria Hospital, the annual reports of the Foster Green Hospital for consumption and chest diseases, and the reports of the health of the county borough of Belfast by Dr. Bailey, is that they do not show any very striking incidence of disease amongst wet spinners, except phthisis or perhaps rheumatism?—Yes, sir, that is the conclusion I arrived at.

1092. You did not arrive at that conclusion from your examination of these young people, but from your observation of patients in the hospital, you do think there are no very striking incidents of disease amongst wet spinners except phthisis and perhaps rheumatism?—Yes, from the figures I had.

1093. With regard to phthisis, would you think this excess that exists might be due to causes outside their occupation?—Yes, I think so.

1094. What causes?—Well, merely from the general position, if I might say, of the spinners in the working scale. I think probably the home life and general conditions of the spinners would be worse than the workers in other trades, but that is only an impression I have gathered from talking to people in the trade.

1095. You have no doubt been through wet spinning rooms?—Yes.

1096. And what impression have you formed in regard to the comfort and health of the workers from your observations?—From my own observations I thought that the wet spinning rooms were perhaps rather warmer than is comfortable to work in, but on my inquiries into the health of the operatives, both from the operatives themselves and from the employer's representatives, the spinning masters, I was surprised by the constant reply that I got. It was that the people in the wet spinning rooms are the healthiest employees in the mill.

1097. Have you noticed that the clothing is always very wet?—I have never felt the clothing, but I should expect their clothing in the room would be damp from the condition of the atmosphere.

1098. And anything else?—And the splashing. If the frame is not properly protected there may be some splashing, and the workers may be wet below the waist from the splashing of the flyers of the frame.

1099. Are you aware there are some Government regulations in regard to the wearing of protection?—Yes.

1100. Do you think that is a salutary regulation?—I think so.

1101. Would you think it sufficient if they are protected below the waist?—Well, I should not say exactly that it is below the waist; I suppose there may be splashing above the waist too. I could not give an opinion on that question.

1102. Do you think it is desirable there should be something to prevent their clothing above the waist getting splashed or wet?—Yes, I think so. I am speaking now without a definite knowledge on that subject.

1103. We will put it this way. Supposing a woman works, we will say, a morning shift from breakfast to lunch, or breakfast to dinner, and that the spray is blowing on her body, and she then goes out in winter to go to her dinner—if she goes home to dinner—or in the evening when she leaves the mill, and goes to her home, would you think that passing through the streets in the cold weather with this wet clothing on would be likely to be injurious?—Yes. On inquiring from the operatives themselves they did not give me the history of suffering from chills or colds. I should think they would be likely to be chilled if their clothing was wet.

1104. Did your investigation on that point go so far as to discover if they changed their wet clothing when they got home?—No.

1105. (*Chairman.*) Are there any symptoms or any specific form of illness that might be expected to develop from going home through the streets with wet clothing, possibly with a cold wind blowing?—Well, I should think that would lead to a lowering of the general vitality and probably an increased susceptibility to almost any infection. Rheumatism is supposed to be caused by chills of that sort, and, of course, repeated chills might be taken as predisposing cause to phthisis or any acute respiratory disease—pneumonia.

1106. You probably know what is meant by splash-guards?—Yes.

1107. Have you had any opportunity of judging of the condition of the workers where they are used and where they are not used?—No, I have not made any observations.

1108. (*Mr. Ewart.*) You said in answer to a question some time ago that the overlookers and operatives themselves considered that the spinners were as healthy?—Healthier.

1109. Than other employees in the mill?—Yes.

1110. Do you know on what they base that opinion?—No, except general observation. I asked about the timekeeping, did they keep better time, and they said yes.

1111. Is that what they judge by?—That was in a number of cases where I asked that question. I asked are these girls often out in the cold weather? If they get a chill going home the night before, are they off work the next morning? and I got the reply that they kept better time sometimes in the cold weather to get into the warm room.

1112. There was no evidence from the returns of sick clubs?—No, I have no evidence of that sort.

1113. (*Professor Lorrain Smith.*) Do you think diet has a good deal to do with these diseases?—I think diet and general home surroundings would have a good deal to do with incidence of disease.

1114. Then you said that you thought the spinners' home conditions were worse than those of other trades?—I thought they might be worse. I have not any definite proof of that.

1115. (*Chairman.*) Coming to weaving sheds. We may take it of course that, generally speaking, artificial humidity is introduced?—Yes.

1116. And that the temperatures are generally high; we may take it anything varying from perhaps 70° up to 80° or about. Have you ever noticed the temperatures that are reached?—I have never made any observations until within the last 10 days of actual thermometer readings.

1117. What has been the result of your inquiry within the last 10 days?—I was surprised to find the temperature in the weaving sheds so high. When I began to think of this question of humidity I thought it was more a question of wet spinning. I did not realise that it was so much a question in the weaving sheds. I did not know that the temperatures went so high in the weaving sheds. I saw some of the records in some of the humid weaving sheds, and I was surprised to see the height which the dry and wet bulb thermometers went to.

1118. I am going to ask you a question, and I should like to explain why I am asking it, because when this evidence comes to be criticised it will be said, here is the surgeon for this district who has been surgeon for a large number of years, and he tells the Committee that until within the last 10 days he had never known that the temperature in a weaving shed was. I understand why, but the public will not. The public will say: "It is a very extraordinary state of things, this gentleman should only have discovered 'this in the last 10 days." But am I right in saying that it is no part of your duty either to supervise or to report upon the sanitary condition of these places?—It is not part of my duty, and it is not part of my duty to read the thermometers.

1119. I put that in because, as I say, to the casual reader it might appear rather an anomaly. As you tell us you have not considered this question particularly in weaving sheds until the last 10 days, have you from a general point of view ever considered the effect on the health of persons employed in various occupations working in hot, damp atmospheres?—No. I have not considered it until I was asked to give evidence before this Committee.

1120. You had some experience, I think, in South Africa?—Yes.

1121. Had you any opportunity there of judging of the effects, say in Natal, where there is generally a very moist atmosphere?—No, I was in a dry atmosphere.

1122. Then you have not particularly studied this question?—No.

1123. Supposing that one of the effects of working under these conditions is to raise the body temperature, have you considered what the effect of that might be from a physiological point of view?—Only from reading the evidence given before a similar Committee of Inquiry in England.

1124. Referring to the Report of that Committee, you have seen that a number of observers took body temperatures and made other observations in regard, I think, to pulse and respiration, on some of the hottest days that they could get at that time in Lancashire, and that they arrived at certain conclusions. Are you of opinion that it would be desirable that a similar examination should be held in Ireland?—I should think it would probably lead to definite information on the subject here on the question of humid atmospheres and their action upon operatives.

1125. Are you able to point to any recorded experiments in that direction that have been made in this or any other country before those made in Lancashire within the last few years?—I do not quite follow, sir.

1126. What I want to know is if you can recall any record of experiments? I mean to say an examination such as was held under the auspices of the Cotton Cloth Committee. Has anything of that sort ever been done before to your knowledge?—I do not know of any.

1127. But I think it would be generally accepted that working or even living in humid moist atmospheres is likely to produce anæmia and general weak state of the body?—I should think from the evidence before that Committee that it was clear that when the wet bulb thermometer got to 75° the atmosphere became a source of discomfort and probably a source of injury to the workers.

1128. But at any rate, so far as your knowledge goes up till the time when these definite experiments were made, opinions on the question were more or less speculative?—Yes, I should say so.

1129. And no doubt there is room for further inquiry in that direction?—Yes.

1130. Have you formed any general opinion about the health of the weavers?—No, no definite opinion. I might say, perhaps, to justify my position with regard to the short time I have had to consider the question, that I have been off duty practically since February.

1131. Just one question before you go. You know there is a standard of purity for the water introduced for humidification, and in wet spinning rooms?—Yes.

1132. And also there is a standard of purity for the air?—Yes.

1133. So far as your knowledge goes, have there been any complaints for or against these regulations?—None to my knowledge, sir.

The witness withdrew.

Mr. Sydney Eraut called and further examined.

1134. (*Chairman.*) I think last time we finished about the question of the readings of the dry and wet bulb thermometers?—Yes, I have a few of them before me.

1135. That is what they reach, is it?—These are notes taken from what I have seen. For instance, when I went to some of these places recently, I have noted the readings that I saw both in the spinning and weaving rooms, and what the firm's record showed—the highest and lowest for the current month. I have quite a number of them if you are interested. I do not know that I ought to give names of firms.

1136. No. At any rate they must not be published; but you could hand in the paper, and perhaps call attention now to the most striking results?—It has been very difficult to get this tabulated in time. Perhaps I, knowing the arrangement of these works, could tabulate them more easily for you. I will do so, but it will take two or three days. I do not know that there is anything very striking. There is a considerable divergence in the weaving, but I would like to draw attention to some of the spinning room readings, because so far as I can see they do not show any relation between temperature and humidity and material being treated. For instance, take the first one. Of course, they are just raw figures. They may be interesting, but I cannot say that they show very much. For instance, taking a mill spinning tow from 30's to 40's. The reading I noticed on the 21st of August, in the afternoon, was 87° dry, 84° wet bulb. That was a fairly warm day.

1137. At that time can you tell us if the room was artificially heated?—It was heated not artificially, but from the incidental heating due to the spinning. I mean, that is, entirely from the hot water in the troughs; the steam pipes were mostly covered.

1138 Was this a fairly well-ventilated spinning room?—It was a fairly high room, and there were two fans at work in it. It is not a large room

1139 What was the outside atmosphere on that day?—The outside atmosphere was bright, sunny, and rather windy.

1140 And the temperature?—I cannot give you the outside temperature on that day, but it would be low down, between 55° and 60°.

1141 With a temperature of 60° outside, and 84° inside, do you think it would have been possible by better mechanical ventilation to reduce the temperature?—Well, I think it would be possible to reduce the temperature by increased ventilation, but I understand you are up against a further difficulty, that it would be necessary to meet that by further warming the water in the spinning troughs

1142. I suppose by covering the spinning troughs and drawing off the steam, and that sort of thing, the increased heat should not be very appreciable?—Well, the radiation from a spinning trough is very large apart from the heat given off by such steam and vapour as escapes. You may see no visible steam escaping sometimes, but I am of opinion that a good deal of vapour which does not show itself as steam is escaping, although the troughs generally fit very well. In that room there was no complaint of the troughs, and there was no visible steam coming out.

1143 Are the troughs in that room made of wood or iron?—Wooden troughs, and fairly thick.

1144. Then there ought not to be very much radiation from a wooden surface, ought there?—Well, it is a large horizontal surface heated from the underside, and exposed to a temperature anything up to boiling point.

1145. (*Professor Petavel.*) That was August of this year?—August of this year, yes. It was a fairly warm day. There is a width roughly of 14 inches exposed for the whole length of a spinning trough, in addition to the warmth being generated from the moisture thrown off. It is usual in the spinning rooms to cover the horizontal portion of the steam pipe, but a short vertical portion of small diameter is frequently left uncovered. Firms prefer to leave that uncovered. It is a short length, and frequently in the case of repairs to the troughs has to be taken down and dismantled, and with the ordinary non-conducting composition coverings they say there is great difficulty in maintaining them in good condition, and anything else seems to be of no use We can get them covered, but the firms prefer to leave them uncovered. I do not think the fact of them being uncovered adds materially to the temperature of the room. It is a very short length, and it is a vertical pipe. The highest reading I noticed in that month for the room was 85°, 80°, on the morning of the 17th of August. That was from the firm's own record, which I have no reason to disbelieve. The lowest was in an afternoon, 77°, 73°.

1146. 85°, 80°. So you happened to come in when the temperature was three or four degrees hotter than it had ever been?—Yes I only took the maximum for that month I was there on a warm day. August was notoriously bad, and it was a very bright day. I was able to drive on an outside car without an overcoat on

1147. (*Chairman.*) August this year or last?—This year. It was one of the few warm days we had. There was another room in the same mill for spinning from 70's to 80's. I thought those rooms were very hot, but in this room it was over 83·5° That is what I read. Their highest was on the 15th of August in the morning, 85°, 80°. You see their highest readings are in the morning.

1148. (*Professor Lorrain Smith.*) In the spinning rooms?—Yes. In the one room they were spinning tows 30's to 40's, and in the next room 70's to 80's. It is frequently claimed that "where you are spinning tow or coarse numbers hotter water is required and more water is thrown off. On the other hand, when they are spinning very fine yarn for warps it is frequently claimed it is of a harder nature, a different kind of flax altogether, and it takes more heat to soften it down sufficiently for drawing. I have not been able to discover any exact relation between the temperature and the stuff handled or the counts being spun I have a number of these, and if you would like them taken out I can give them. The most interesting and peculiar of them all was a thermometer reading in a room at just about that time where from 20's to 100's were being spun with the dry bulb 86° and the wet bulb 89°.

1149. What is the meaning of that?—I should attribute it to a thermometer which had slipped. It did not appear to have slipped in its casing, although the portion of the back was damaged, or else it had been inadvertently splashed with cold water. I do not think it was intentional.

1150. (*Professor Petavel.*) I thought the divisions were always marked on the thermometer stem. Is not that a requirement?—They are marked on the stem nearly always, but the stem may still slip.

1151. (*Professor Lorrain Smith.*) The wet bulb was what?—89°.

1152. And it should have been 81°?—The dry bulb was reading 86° Another reading in that same room was, 75°, 73°, the lowest that month. It was a hot and very humid room. I should think either the one was 5° slow or the other was 5 fast—by accident. It is quite conceivable.

1153. Then there was a difference of ten degrees between that and the other thermometer in any case?—I am speaking of another day.

1154. (*Chairman.*) On this point you have probably seen the Home Office Order in regard to the use of hygrometers?—Yes.

1155. The members of the Committee have not seen it yet I should like to just refer to that question I will do it in this way, by asking if you think that this new Order will be an advantage. It is rather long, but doubtless you have read it?—Yes, I know that.

1156. Do you think that this will lead to more accurate readings?—Well, I do not know what your experience of Lancashire has been, but I have been thinking over the matter and I rather think there is a greater inducement hitherto to make a true record in Ireland than in Lancashire and to keep the thing in order.

1157. I mean more as regards the construction?—The average hygrometers are made by the reputable firms, and they are nearly all of one standard type. The only objection I have is, that I think a lot of the readings we get in the spinning rooms are in one respect unduly high as regards the dry bulb. The hygrometer is put in the only available place in the room, that is on the column, which, from the construction of spinning rooms, is nearly always opposite the end of the frame. If that is the frame, and another one here, and another there (*drawing sketch*), the columns supporting the room are nearly always at the end of the frame. The construction of the columns determines the position of the frames. They put the hygrometer on to that. It is not a very good fixing, because it is apt to be knocked about in moving, and frequently they put it rather nearer the frame where it is protected by the column. In some cases I have seen it actually on the frame.

1158. I think it would be as well if I read this. This is called the Hygrometer Order issued under the Regulations for Cotton Cloth Factories by the Home Office in March 1912. (*Same read.*)—I do not know if any suggestions can be offered with regard to that. I think it is pretty well anticipated. The only thing is, I think, that the readings scheduled there, the coarseness or openness of the readings would involve fresh thermometers in Belfast. I would not like to speak off-hand, but I do not think we could read many hygrometers here at 2 feet or 4 feet away.

1159. (*Professor Petavel.*) That was a point brought up strongly, that every hygrometer was an indistinct and unsatisfactory instrument, and something better was wanted?—Undoubtedly. I find a hygrometer difficult to read unless I am within about a foot of it. You cannot read them unless you are accustomed to the particular instrument. There are a lot of different ones, but that particular one you cannot read without getting close enough to it to influence the reading if you are there long enough.

1160. (*Chairman.*) I would suggest there will be plenty of time to consider this order?—Yes, they are marked in the same way. I do not think there will be any difficulty in applying that.

1161. If you think there is anything in this that calls for alteration on account of your particular industry or conditions in Ireland, perhaps you will let the Committee know before we report?—Yes. As a matter of fact, with regard to placing the hygrometers and separating them from columns, and so forth, by non-conducting material, I have recommended that in a large number of cases. I foresee no difficulty in that, but I would like to see a model instrument of that size in a room before I can judge.

1162. Now we come to the question of splash-guards. Did we go into that before?—You did ask me something, and I wanted by your permission to rather amplify an answer I believe I gave in answering you off-hand. You said, is that regulation observed in Belfast, and I think my answer was, No

1163. Is what observed?—The regulation regarding splash-guards. You took it as a whole.

1164. I think what I asked you was about the bibs?—Well, I was going to say this, that if I had answered in that way as to whether the regulation was observed I should have said, No. Then I should have added the words as regards the fitting of splash-guards, but as regards the provision of bibs and aprons I understood they had been distributed amongst the spinners. Some few spinners will wear a bib. They will all wear an apron except on certain very hot days in the year. Then it is only a question of small degree of having an apron which goes right round.

1165. We are going away from splash-guards now. In regard to the covering, my point is this, that the law at present requires that there shall be not only an apron, but where splash-guards are not provided there shall also be a bib?—Yes.

1166. And in going through the rooms I do not think I have seen a single woman wearing bib?—I only saw three persons all last week wearing bibs, and one of them was a little boy.

1167. That seems, perhaps, to show that some alteration in the regulation may be necessary; but the fact remains, the regulation as it exists is not observed?—No, practically it is not observed, but so far as the employer is concerned, as he read the regulation he considered he had an alternative; if he did not provide splash-guards he would provide a waterproof apron and leave it to the worker to wear it. She will wear an apron, but she will not wear a bib if she can avoid it. I questioned three women: Do you wear a bib? The answer was, No, it is not necessary. In the case of tall women it may not be necessary, but in the case of a short woman it would be. I suppose you might take it that really no moisture can damage anybody which flies from the yarn at a height above the top of the spindle. Directly the yarn leaves the roller, moisture begins to be thrown off just before it reaches the spindle, but very little. Take the height of the spindle above the floor—say from 3 feet 1 inch to 3 feet 6½ inches—it varies for this reason. The frame is horizontal, but the floor drops a little, so at the higher end from which the water drains it is roughly 3 feet 1½ inches above the floor to 3 feet 6 inches at the other end. Many women are not splashed at all above the waist from water at that height. A short person would be. Then the claim is made by the little girls that they are not at the frame while it is running. They come to it, to doff when it is stopped, although they get wet from the back while they are doing that. Of course, they do go along to oil and so forth, but generally it is the spinner and her assistant who are at the frame while it is in motion.

1168. We are talking about efficient splash-guards. There is a requirement to provide splash-guards. I think that is fairly clear. I know very well at one time there was a great objection amongst the workers to the use of splash-guards, and it was very much in deference to that objection that the regulation was made and the alternative given of wearing not only an apron but a bib. Now of late years, perhaps, opinion may have changed. Have you been able to gauge the feeling of the workers towards the use of splash-guards, or have any splash-guards been made of a modern device which would make them more acceptable to the workers?—I have one mill where there is a splash-guard which they insist on the workers using, and they are able to use it. It gives a projection of only 8½ inches from the gable end of the machine, and the workers like it in that particular mill.

1169. Can we have the name of that mill?—Yes, I have no objection. They are not used on all the frames, for two reasons. There comes a limit in the spinning where you may say practically no moisture is thrown off. When you get over about 180's to 200's it is noticeable that the floor is hardly wet at all; there is practically no moisture thrown off; and the same with a very small flyer.

1170. Is there any other firm you recommend us to see, where splash-guards are used?—Yes, another firm who recently opened a mill have put on a new form. It is a splash-guard made by ——. It is exceedingly nice, and it suits a mill which is fitted with sufficiently wide gangways to allow it to be used. I had another mill which was fitted throughout with splash-guards originally, but a new manager came there, and for some reason or other they have taken off most of the splash-guards. The reason given to me was they had become damaged. They were of wood, and were found unsatisfactory, and too heavy to manipulate. They have taken them off, but they are going to put metal ones on instead. There are some which are hinged, and when the woman wants to reach up to the creel they move in and either a spring or a weight brings them out.

1171. Are they automatic?—They are automatic to that extent. Those were used throughout the mill. There is another mill in Belfast in which splash-guards are used of a type patented by the manager, I think. There is the splash-guard. It stands in position, and is held by a catch. I think it takes 9 inches. The opinion prevails in some mills that when an end has to be "laid on" you cannot use a splash-guard. Where the ends are to be "pieced" it is sometimes said to be easier, but as to that I would not like to express an opinion. That is one form; it is rather wide. It does not make a very big projection, and does not take up very much room.

1172. Can you offer any further suggestions on the splash-guard question?—I have one mill, but only one mill, where it would be absolutely impossible to put splash-guards, so far as I have seen, and in that case the columns supporting the building are erected in the middle of the working gangway, so that whatever space exists between the frames is reduced by the column being there, and it would be further reduced to an unworkable extent, I believe, if splash-guards were fitted. In fact, at one of the frames it could not be put.

1173. Is that a column in each of the bays?—In that particular case. The room is *this* shape, and the machines stand *here*. That is the machine. This is what they call the stand, or working place, and in that mill the columns, instead of coming at the end in the main gangway, are in the stand, two columns in each, and they would undoubtedly be in the way of any splash-guard. But there the workers have waterproof aprons, and they wear them, but they do not wear a bib. Out of a dozen women you find a great diversity of opinion. One will wear a bib, and the one working next her would say she would not have it at all. I have hesitated to take legal proceedings against the women, but perhaps you do not mind my mentioning this. If you look at the regulations, if an occupier wanted to avoid the trouble or expense of putting on a splash-guard, all he has to do is to provide waterproof aprons, and, evading further responsibility, would want me to come along and make his women wear them.

1174. No, I do not think so. The Flax Regulations provide that, "Efficient splash-guards shall be pro-" vided and maintained on all wet-spinning frames of " 2¾-inch pitch and over, *and on all other wet-spinning* " *frames, unless waterproof skirts and bibs of suitable* " *material are provided by the occupier and worn by the* " *workers*." Consequently if the workers do not wear these things then the occupier has to provide splash-guards?—Of course, in the part relating to frames where there is 2¾ pitch there is an absolute obligation. That is carried out, except in one mill. In one other instance I was told bluntly by a manufacturer—who, of course, being an Irishman, knows all about the law—"I am not bound to provide splash-guards. I can " provide waterproof aprons, and it is your business " to get them worn."

1175. He is obliged to by the law, unless these things are worn. That is clear?—I would like to say this. Of course, those regulations have only been in force about five years, and we have rather to be able to meet with any practical difficulties, and to cope with them efficiently, and it is one of the regulations we have rather left to wait, while the manufacturers are spending a very large amount of money in a tangible form, namely, in exhaust ventilation in dusty processes.

1176. It has been a pleasure to me coming back to Belfast to see the progress that has been made in regard to dust and ventilation, and I do not think we can do any good by going into the legal points. If the thing has gone on so long it probably will go on, but it is evidently a question we must consider of what is the best way of meeting a regulation which is not being carried out, and to consider whether we can suggest something that will be efficient, and will be carried out?—If I might make a suggestion, I would suggest the lines to go on, which I think would be found most satisfactory all round would be to require splash-guards, except I would go a little further. I would say universal splash-guards, except in certain conditions, where either they are impracticable owing to the structure, and thus put the onus of proof on the employer, or where they are unnecessary, having regard to the small amount of moisture thrown out. You very soon are able to draw a line limiting or separating the frames which either throw off moisture and those which do not—I mean harmful moisture. Having come thus far and dealt with the fine frames, you only then have left certain coarse frames to be fitted with splash-guards, and from the notes I have made I find a number of frames conforming to this sort of arrangement, that is to say, measuring from the centre of the spindle on one side to the centre of the spindle on the other side, I find a number of frames from 4 feet 3 inches to 5 feet. Now, I think, I described that to you last week.

1177. I think we have that down last week?—Yes. I had not my full note of it then, but I described to you then a mill with splash-guards at a centre distance of 3 feet 10 inches. If it can be done with 3 feet 10 inches it can be done with everything beyond that. If I might make a suggestion, I would prefer, as an inspector, to attack the subject on those lines. I think there is no doubt whatever the splash-guard does keep the floor comparatively dry.

1178. The question of boxes in spinning rooms and the non-use of cloak-rooms and cupboards. I think, was discussed last time?—Your secretary asked me if I would give a note of some mills or places with clothing accommodation. I could give a few. I can tell you what I think of those existing. I may perhaps tell you the rough and ready thing. Spinning, of course, is different to weaving. This is a very favourite sort of thing. That is the outside wall of a spinning room, and that is a frame and this the next frame, and this is the main gangway (*drawing sketch*). The window openings are always here, opposite the stands, to give light in the room. It is quite customary in spinning rooms to have a box there, say 15 to 16 inches in depth. Now, that is a wooden box, and the women can put their clothes in. I have examined a large number of these boxes and in many cases have been able to make suggestions. So long as that box is kept clear from the wall and is fitted with a back, it will keep the clothes perfectly dry.

1179. Supposing the clothes are wet when they go in?—At the one end of the spinning frame there is a steam pipe, and that is nearly always the warmest end of the spinning frame, and if the wet clothes are put in they get a measure of drying. If it is a wet day a woman puts her boots and shawl over the creel where it gets dry, and then she will put them in the box.

1180. You have seen that for yourself?—Yes. I have seen them left out all day, and I have seen them put in the box. I have frequently put my hand in the box to see the condition they are in. The boxes vary from mill to mill, and the condition in which the workers keep them varies in the same room. At this very hot mill I was at, where I first gave you the temperature readings, some of the window boxes were very good, and I complimented two or three of the women on the clean way in which they kept their boxes, because they were very clean indeed. Others again are dirty, and if the boxes are not kept clean they get covered with a nasty wet mildew on the inside. Now iron boxes placed on the landings outside spinning rooms were tried. Some were got from a good firm in England who advertise them, but they had to be given up. They are absolutely non-absorbent, and they were very bad. Quite a number of the wooden cupboards are provided in the mills. In one mill there was only a little box like a cupboard up on the window casing. It is a fairly dry mill, and the clothes keep nicely there. That is a mill at —— fitted throughout with splash-guards.

1181. (*Chairman.*) Whose mill?——.

1182. Are there any other points, do you think?—In a mill quite recently I saw simply an attempt made to provide clothing accommodation like this (*drawing sketch*). It is in front of the window. They have simply put a cover over here, and they have put a row of pegs to hang the clothes on at about 8 inches apart, and to keep them off the wall they simply put up a parting strip along in two places on the wall, and in between is quite wet, and it is not at all an agreeable place. It would be wet on a wet day and dry on a dry day. I have another room where they have an engine-room at the back, and this thoroughly warms the wall. They have put a row of cupboards along and they are quite dry. That is the ground floor room, where the readings were 76°: 71°, and in February 1911 the highest reading was 82°: 76°, and 72°: 66°, was the lowest. In May of this year 82°: 76° and 75°: 70°. You see it is a pretty hot mill. The workers all say they like the boxes very much except for very wet clothes.

1183. I do not think we have had anything from you about the weaving sheds. Can you tell us anything about the general question of the heat in these rooms?—Yes, I have some particulars about weaving sheds. I go to quite a number of them. I have a note of some humidity records there, too. I and one of my juniors have made some inquiries for you. Here is one weaving shed which is rather humid. It is in Portadown. They have three weaving sheds, and they weave cambrics from 14^{00} up to 25^{00}. Of course the weaving measure, as you all know, is, 14″ means 2,800 warp threads in a 40-inch reed space. A little glass they read with is made for those measures.

1184. We learned something this morning on that point?—It is examined by that little glass. Five shots equals five threads of weft in 37 two-hundredths of an inch. In this shed you might like to note the humidity as well as the ventilation, and both the lady inspectors and ourselves have taken air samples. They did it five years ago, and we did it recently, and they both agree. The ceiling inside is plaster, and the outside of the roof is lime-washed two or three times a year. If it is a very hot season they might do it two or three times, but if it is dirty, wet weather they do not whitewash it so often. There is no obligation on them to do it, but they do it.

1185. (*Professor Petavel.*) There is no regulation about white-washing?—Not here. The regulation is different in Lancashire, but they do it here as a means of keeping down the temperature. My reading on the 22nd July was 78°: 65°. Of their own reading, the highest was 85·5°: 83·5°, on the 5th of July, and the lowest on their record was on the 1st July 70°: 68°. In that shed there is only one row of steam jets, and the humidification is by air blown in by a fan, but the air is sprayed first to wet it. That is a system imitating or anticipating several of the Lancashire firms, Mather and Platt, and Hart's and others. It was a local one made in Belfast by Nield, and wherever that is in use we get a high degree of humidification. In several sheds I have had too much, but it is a system not easily controlled, and might go out of fashion. So one might put it aside.

1186. (*Chairman.*) What about the cooling effect?—If they wish, they can blow a little steam in as well in this air trunk in winter.

1187. And in the summer?—They can put cold air.

1188. Has that a general effect in cooling the shed?—They do it for that reason. I think Mr. Herdman, who was before you this morning, could tell you something of that, because he made some experiments on these lines in his shed. I have not a note of the result.

1189. (*Professor Petavel.*) I think that is a shed we saw. Could we have the name of it?—This is ——

1190. It is a home-made humidifier?—Theirs may be home-made, but it is really taken from a form of Niold's. Who Nield is I do not know. I think they are out of existence now. I have seen an apparatus quite recently.

1191. My impression was they really did use steam?—Partly steam and partly water. It is a mixture. I presume the object of the steam was that between summer and winter they could vary the proportion of steam and water. I took a note of another shed using that, but I cannot give you particulars. In that shed they are working from 14‴ up to 25‴. In another weaving shed from 5‴ up to 14‴—a good deal coarser, undoubtedly, but they were opened quite recently as a dry shed. Then they put in some of Matthews and Yates' humidifying units, and their temperature with that system was 73°: 69° on the 23th August. Their own reading was 71°: 68° on the 8th August, and 64°: 61° was the lowest on the 26th of August. There is a considerable range there, but the degree of humidification is not so much, and the shed is kept at a lower temperature.

1192. (*Chairman.*) Were those hot days?—Fairly hot days. I have not a complete note of the outside temperature. Another one in County Antrim, working shirtings and some coarse stuff up to 20‴, was originally rather a hot humid shed. The occupiers put in a Mather and Platt's humidifier recently, and they consider the temperature has been much reduced. I noticed the hygrometer read 78·5°: 65°, but in May of this year the highest recorded reading was 76°: 74°, and the lowest 60°: 58°. As a matter of fact, when I was there, there was also a second hygrometer, and that showed rather less than two degrees difference, but it was too near one of the ventilating trunks.

1193. (*Professor Lorrain Smith.*) Where was this?—This was at ——

1194. Were they satisfied?—They are quite satisfied with it, and on the 18th July their highest reading was 75°: 72°, and on the 25th July it was 69°: 66°. They say it is very uniform. It is maintaining about three degrees difference, but they also say it is rather local in its effect on the yarn.

1195. (*Professor Petavel.*) Do you know of many mills in which cold water is used?—No.

1196. This would be the only one?—I do not know. I could not speak off-hand, but they are comparatively few. The usual thing is steam jets.

1197. Could you point out any mills of that kind when you are sending in those figures?—I will endeavour to do so.

The witness withdrew.

Mr. Michael Corbett Andrews called and examined.

1198. (*Chairman.*) What is the name of your firm?—John S. Brown and Sons, Limited.

1199. What is the name of the works?—We have two power-loom factories, one is called Lower Lodge Factory, and the other is called St. Ellen Works. I suppose it is only power-loom factories you are dealing with?

1200. You are a member of the firm?—I am works manager.

1201. You said power loom. You have no spinning?—No, no spinning.

1202. Can you tell us the class of goods you manufacture?—We manufacture damasks, sheetings, and household linens—mostly fine damasks.

1203. And I take it in common with most manufacturers you think humidity to be necessary for efficient weaving?—I do.

1204. Have you ever tried without?—Yes, in the damask sheds until quite recently we have had no humidity at all.

1205. Since when did you begin to use humidity?—We got full humidity on to our St. Ellen damask sheds—there are two—about last December. We experimented for about three months before that with partial humidity. Our shed at Lower Lodge factory only got full humidity on last August—last month.

1206. (*Professor Lorrain Smith.*) By full humidity, what do you mean?—From four degrees difference. We work from three to five in the damask sheds.

1207. (*Chairman.*) You maintain that?—We try to.

1208. That does not seem to be a very serious state of things. It is all damask, is it?—No, we have two plain shops, one at each factory, working plain linens—principally wide sheetings, and also narrow linens.

1209. In the plain sheds, what difference do you maintain between the thermometers?—Two degrees.

1210. Do you think you could work with, say, three?—We do not think we should get—in fact we know we should not get—such good results.

1211. Have you ever tried it?—On certain days with certain outside conditions we cannot get two. Then we have what we call bad weaving.

1212. What kind of conditions would those be—could you tell tell us?—I think they happen largely in March with cold, dry winds. Of course, it depends on the situation of the shop largely. The north wind will affect our Lower Lodge shop; it is open to the north.

1213. Cannot you get it with your humidity apparatus?—With great difficulty.

1214. What system of humidity have you?—In one shop the ordinary steam jets with low-pressure steam, and in the other shop, which is a small shop of about 49 looms, we have Mather and Platt's system of water-spray.

1215. From which system do you get the best results?—In the shop which is humidified with steam we make fine work up to about 23 hundreds, heavy sheeting. In the other shop we made some 16 hundreds, rather heavy sheeting, and the results were not very good.

1216. That was with Mather and Platt's?—With Mather and Platt's.

1217. Taking the very hot days in summer, which shed is considered the more comfortable to work in—not talking of weaving, but from the point of view of comfort?—There is no doubt the water-spray system keeps the temperature down. For instance during last year, which was a hot year, I should think the shed was probably four, or five, or perhaps six degrees lower temperature than the other one

1218. So much as that?—It is probably a cooler shed though. I am considering one here and another one eight miles away, under different conditions

1219. Take last summer. Can you tell us the maximum reached in each shed on the wet bulb thermometer?—Of course, you have the records, and I speak from memory; but as far as I remember, we touched 75°. I am not sure if we went to 76° on the wet bulb in the shop which is humidified with water spray. In the other I believe we reached 82°, if not 33°.

1220. Had you any complaints from the workers as to the oppressive state of things?—None.

1221. Had you any reason to believe they were suffering from the excessive heat?—No, on the contrary. I took an opportunity last August of walking round the shop several afternoons—the shop which is humidified with steam. They had been working practically from the early morning at, I believe, over 80° on the wet bulb, and I noticed with regard to the men who were working there two or three with their waistcoats off. I saw one man with his shirt open at the neck, but the rest had not troubled to take their waistcoats off. I cannot say they did not look a little warm; naturally they did; but there did not seem to be anything extraordinary. It was 80° on the wet bulb, and had been since the early morning—perhaps over.

1222. Have you any methods of keeping down the temperature in your shed? Do you whitewash the roof, for instance?—Yes, the glass and the slates. We also, of course, ventilate.

1223. What ventilators have you in each shed?—In both of them we have fans

1224. Are they exhaust or plenum fans?—I have tried both exhaust and plenum. Mather and Platt's system was fitted up with plenum. I have tried both in the other shop.

1225. From which system do you get the best results as far as cooling the shed is concerned?—I could not find any difference. The only difference I did find was that there was a different distribution of the humidity.

1226. Under which system was it best distributed?—I do not say best. I cannot say one was better than the other, but in the case of the plenum the humidity seemed to be more towards the two main doors at one end of the shed, whereas when we exhaust the greater humidity is at the other end of the shop. That was the only difference I noticed.

1227. With the plenum system was there any means of exhaust excepting those doors?—Only those doors and what got away at the roof through the glass.

1228. Of course, it followed the easiest road?—Yes, it evidently went to the door, but we could not find any difference in temperature one way or the other.

1229. Do you think it would weave satisfactorily if the dry and wet bulb readings were further apart than two degrees? That seems to be a sort of generally accepted doctrine?—That it would not be better?

1230 That if they went further apart the weaving conditions would not be good?—Yes.

1231. You think that?—I do

1232. But, now, have you ever tested that by actual experiment?—Simply on the days when we have not reached two degrees difference, we do not get as good results; we cannot hold the difference between the wet and dry bulbs absolutely uniform through the whole day and through the variations

1233. You mean sometimes you find it difficult to get two?—Yes

1234. And then your weaving is inferior with a greater difference than two?—Yes, for fine goods, certainly.

1235. What sort of health do the workers have? Have you any means of judging? Take the days they are off?—I think it is fairly good. I have some figures here. I do not know whether you consider them evidence. Perhaps I could give them to you

1236. Yes, we should like to hear them?—I must explain just what they are based on. I take daily records of the looms which are idle for various causes which are scheduled under the various heads. One of the heads is: "Looms idle for weavers absent." Now, if we are right in assuming the absentees from other causes than health are fairly constant, the differences in that column ought to indicate the state of health

1237. I mean are you able—perhaps not at the moment, but from subsequent inquiry—to say what is the cause of absence?—No, I could not. You see naturally the results are only taken for our own information as to the reason for looms being idle, but we cannot tell whether a weaver is out on account of ill-health or from some other cause.

1238 You can form some opinion as to whether it is the custom of the workpeople in the district to take a holiday?—Yes, you will see that in certain months.

1239 They are absent not on account of ill-health, but just because they want a holiday?—Yes, but I take it that during a normal month's working the absentees through causes other than health would be fairly constant. I do not know whether I am right in assuming that point

1240. The number of absences would not tell us very much, would they?——

1241. (*Professor Lorrain Smith.*) If that assumption is right, they would?—Of course it is a question.

1242. Have you any reason to suppose there is anything wrong with the assumption?—No, nothing. That was the assumption I formed. You see in certain months, for instance, the months of April and August, the percentage of absentees goes up, which is due to a poor attendance after the Easter holidays and after the July holidays

1243. (*Professor Petavel.*) Could we have the figures?—I can give you the figures here. For instance, this is a comparison at the Lower Lodge factory for the years 1911 and 1912 With regard to these figures I should say one is a percentage on the damask shop and the other the linen shop The damask shop is not humidified.

Month.	Percentage of looms idle for absentee weavers in Lower Lodge Factory.	
	Damask Shop (non-humidified).	Linen Shop (humidified, Vortex System).
1911.		
January	2·21	1·45
February	3·52	1·87
March	2·41	0·42
April	1·39*	5·19*
May	1·71	1·85
June	1·54	0·82
July	2·81†	2·04†
August	2·85	2·27
September	2·18	0 63
October	1·36	0 82
November	0·78	0 00
December	2·39	0 59
1912.		
January	1·41	0·23
February	1 54	0·08
March	1·67	0·31
April	3 80	1·70
May	2·37	0·15
June	2 07	0·08
July	4·74	1·67
August	2·41‡	0·09

* Affected by Easter holidays.
† Affected by July holidays
‡ Humidity introduced in August 1912

Note.—More men are employed in the linen shop than in the damask shop.

These figures, I should say, only reached my hands this morning. I got my staff to make them out on Saturday. I have not studied them as much as I might, but it seems to me to show certainly the attendance in the humid shop was better. Whether the health is better, of course, I do not know.

1244. (*Professor Petavel.*) That is a very cold humid shop?—That is a cold humid shop.

1245. (*Professor Lorrain Smith.*) The variations seem to be the same in all, when the one varies the other varies in the same direction?—Apparently.

1246. Is not it the same thing that is the cause of the variation, only they are not so big?—Apparently

1247. (*Professor Petavel.*) You have not similar figures for your plain shed which has steam jets?—No, unfortunately I have not, because I cannot get at the figures. The results are kept in a different way and I cannot get them out.

1248. You could not have them later?—I am afraid I cannot, but I can give you the following figures for the whole of our other shed, including damask and linen, showing the difference which occurred when humidity was introduced into the damask shed; and there again it follows these lines practically, that is to say, the attendance has been better since the humidity was introduced into the damask shed.

Month.	Percentage of looms idle for absentee weavers in St. Ellen's Works.			
	1909.	1910.	1911	1912
January - -	—	2·2	2·3	0·9*
February - -	—	1·7	1·9	1·5*
March - -	—	1·8	2·1	1·0*
April - -	—	1·2	4·2	2·7*
May - -	0·6	2·1	1·7	1·2*
June - -	1·0	1·4	1·5	1·5*
July - -	1·6	2·2	2·6	1·7*
August - -	0·9	1·9	2·2	0·7*
September -	1·2	2·2	1·7†	—
October - -	1·9	2·2	1·8†	—
November - -	2·7	3·4	1·8†	—
December - -	2·4	2·8	1·2*	—

The figures refer to both damask and linen looms.

The figures marked * relate to the period when humidity was introduced into the damask shop, and those marked † to the period when humidity was experimentally tried in the damask shop.

1249. (*Chairman.*) Of course, in the damask shop you have a fairly wide difference in the readings?—Yes. Still the figures will go to show that a certain degree of humidity is not bad for the health.

1250. (*Professor Lorrain Smith.*) What we are interested in chiefly is the high degrees?—Yes. Of course, there is a point I should mention, perhaps. There are more men employed in the linen shop than in the other. I do not know whether that has an effect on the attendance.

1251. Are not the variations from month to month a good deal bigger? You jump from 0·42 in March to 5·19 in April?—Yes.

1252. (*Professor Petavel.*) Is there any reason why Mather and Platt's should not be used in the other shed, the plain shed?—I think we do not get as good weaving conditions, even with the same relative humidity, without the heat.

1253. Even when you get up the same difference between the themometers?—The same difference at the lower-temperature does not seem to give us as good a weave.

1254. (*Chairman.*) A great deal would depend upon the number of apparatus you have?—Yes.

1255. I mean you can get any amount of humidity by using more humidifiers?—Yes. As a matter of fact, the cubic contents of that shop are 94,000 cubic feet with six heads.

1256. You said you had difficulty in getting your humidity, but you would not have difficulty if you put in a few more humidifiers?—The difficulty is not with the steam jets. We can get any amount of humidity there.

1257. You have told us already one shed is cooler than the other by four or five degrees?—Yes.

1258. So, although you are getting the humidity, you are doing it at the sacrifice of four or five degrees of temperature?—Yes.

1259. Which the workers have to work in?—That is so.

1260. That, of course, is a consideration on the hottest summer days?——

1261. (*Mr. Ewart.*) I think you drew attention to the fact that one shed is more exposed than the other?—It is. One has two and a half outside walls and the other only one.

1262. (*Professor Petavel.*) Which has two and a half?—The shed with the Mather and Platt humidifiers. It is a cooler shed. It is quite open.

1263. (*Professor Lorrain Smith.*) Does that make it more subject to dry winds?—I think it does.

1264. So that Mather and Platt's plant is at a disadvantage?—It is at a disadvantage. I may say when I started with Mather and Platt's plant I thought from what I learned I could keep the temperature down, and I insisted upon it. I thought the workers should not work in a high temperature, and I insisted on keeping the temperature down to 65°. We did it for three or four months, but we had to give it up and go up to 70° or 72°.

1265. (*Chairman.*) Were the weaving results very bad at 65°?—Not very bad, but they were not as good as we should like to have seen.

1266. Between 65° and 75° was a wide margin?—Not 75°; 71° or 72°, perhaps.

1267. (*Professor Petavel.*) You consider 71° the best weaving temperature?—Yes, anywhere from 68° to 72°.

1268. (*Professor Lorrain Smith.*) For what goods?—We make up as far as a 23 hundred heavy sheeting.

1269. That is fine weaving?—That is fine for heavy stuff. If it is any information to you, that stuff would weigh about 5·25 ozs. to the square yard.

1270. (*Professor Petavel.*) Do you consider that stuff needs as much humidity as any other in the trade?—I do not know.

1271. How would it compare with cambric? We have heard a good deal about cambric?—I cannot say. I have no experience of cambric manufacture at all.

1272. (*Chairman.*) Supposing the law said you must not have any artificial humidity after the wet bulb reaches 75°, do you think that that would seriously inconvenience you?—It would. For instance, during a hot year such as last year we could not have kept our shop going for three months.

1273. You would not have got the relative humidity?—No, we should have frequently had to stop fine goods at least half the days in the three months June, July and August.

1274. (*Professor Petavel.*) Is that based on experiment? Do you know it would be impossible to weave, or do you merely assume it would be?—I presume.

1275. You have not tried it?—No, I have not. I have not dared to shut it off.

1276. (*Mr. Ewart.*) If the temperature of the shop was 80° or 82°, and you were limited to 75° wet bulb, is there any experiment required to tell you that that would cause you difficulty in weaving?—I do not think any experiment is necessary.

1277. That is to say, your daily experience is that to get the best weaving results you require to keep up the two degrees difference if possible?—That is so.

1278. And therefore any greater difference than that means poorer weaving?—That is so.

1279–80. I cannot myself see why experiment is necessary?—When the difference is greater than two degrees, and the relative humidity drops, we get bad results; and if we let it get further we get worse results.

(*Chairman.*) It is a question of degree. If maintaining the very best weaving results means that they are to be maintained at the expense of the health of the worker—I do not say it does, but if it does mean the workers are to suffer—that is a consideration. It is a consideration whether inferior weaving conditions might not be put up with on a certain number of the hottest days of the year, but it seems to me that the experiment is desirable, in order to see to what extent the weaving actually does fall off.

1281. (*Mr Ewart.*) Might I ask, did you ever know of a weaver ask for less humidity?—Never.

1282. They have asked for more, I presume?—Many of them.

1283. (*Professor Petavel.*) Do you consider that there is any limit? We have been told that in certain sheds there is more humidity maintained than is necessary for weaving, and then the weaving actually becomes bad. Would you consider that probable or possible, or do you consider the weaving always improves, the more humidity you have?—I really do not know. I have never tried.

1284. (*Professor Lorrain Smith.*) There is another point you might be able to tell us and that is the distinction between good weaving days and bad weaving days not being given perfectly by the thermometers?—I think that is right.

1285. Can you throw any light upon that rather mysterious condition?—I wish I could. It is an undoubted fact that on some days with the same relative humidity you will not get as good weaving.

1286. (*Mr. Ewart.*) With the same humidity?—With the same humidity, the outside conditions varying.

1287. (*Professor Petavel.*) Would that always be a dry day outside, or is it more difficult to fix the reason of it?—I think it is a more complicated problem than actually the dryness outside. I think it in some way depends on the conditions, but I do not know how.

1288. But you are sure there is a difference with the same readings of the thermometer?—Distinctly there is a difference.

1289. (*Professor Petavel.*) It has been suggested that turning off the steam at a certain temperature should be tried by a few firms, so as to get definite figures as to the stoppage of looms or breakages; would you be willing to attempt anything of the kind?—Certainly.

1290. And come back later?—Certainly, I would be willing to do it until it reached such a point that we could not weave. I am not prepared to spoil hundreds of pounds' worth of work, but I am prepared to try it. I would have no objection whatever to trying the experiment as long as we could reasonably weave with it.

1291. (*Chairman.*) Have you anything you would like to say?—Nothing, except those figures with regard to the damask shop when humidity was introduced. I will leave them with you if you like.

The witness withdrew.

FOURTH DAY.

Tuesday, September 17th, 1912.

At Belfast.

PRESENT:

COMMANDER SIR HAMILTON FREER-SMITH, R.N., C.S.I. (*Chairman*).

Mr. HENRY CUMMINS.	Professor J. E. PETAVEL, F.R.S.
Mr. HERBERT EWART.	Professor LORRAIN SMITH, F.R.S.

Mr. D. R. WILSON (*Secretary*).

Mr. JAMES HENRY HAMILTON called and examined.

1292. (*Chairman.*) What position do you occupy?—Managing director of the Whitehouse Spinning Company.

1293. You do spinning and weaving?—Yes.

1294. What kind of weaving?—Coarse goods.

1295. How long have you occupied your present position?—For the last nine years.

1296. How many years of practical experience in the trade have you had?—Over 30.

1297. How would you describe the counts?—From 20's to 70's.

1298. Of course it is necessary that spinning rooms shall have a moist atmosphere?—Absolutely.

1299. It cannot be helped on account of the——?—Nature of the business?

1300. Yes. I mean the warp must pass through troughs?—Yes, water.

1301. And there is a considerable spray from the flyers?—Yes.

1302. Those are the sources of moisture, I take it?—Yes.

1303. Are there any measures taken in your spinning rooms to keep the workers as dry as possible?—Yes, there have been various things done. Aprons are generally worn to protect the spinners from the spray of the flyers.

1304. And is anything worn over the chest to protect the chest?—Not generally worn, but always supplied.

1305. Supplied, but not generally worn?—Not generally worn.

1306. What measures do you take to keep the steam confined in the troughs?—Well, in most firms——

1307. Say your own firm?—In our own firm the frames are all new, and the dippers in the back and the front are all sealed as far as it is possible to seal them. The apertures are left as small as possible to keep the heat and steam from getting into the room.

1308. They are covered?—All covered.

1309. And the dippers are in front of the apertures through which the rove comes?—Yes, the space. There is a back and front dipper, and each gets into the water and so seals it except at the smallest possible point.

1310. Do the dippers go right under the water?—Right under the water.

1311. Have you any method of carrying off the steam from the surface of the troughs?—None further than ventilation with fans.

1312. No local suction?—No local suction.

1313. Are your pipes for carrying off the steam covered with insulating material?—All covered.

1314. Can you tell us approximately the highest temperatures that are reached in your spinning room?—Do you mean in the dry bulb or wet bulb—dry bulb?

1315. Yes, or both, if you can give it?—Well, the highest temperatures that are reached with us is generally in the summer months, June, July or August, according to the temperature outside. Sometimes we reach as high as 86° and 87° in the dry bulb, with a difference of four, five or six degrees, depending on the conditions of the outside weather.

1316 Eight-six degrees or 87 degrees, but with about four degrees difference?—Yes, up to six occasionally. On a very humid day we might get down to three, but it is very seldom that.

1317. Those, I take it, are quite exceptional days, where you go up to that high temperature?—Yes, in the summer-time. We do not often reach that in the summer—80° in the summer.

1318. (*Professor Petavel.*) Have you reached that this year?—On some days in May we had a temperature up to 86° or 87°. It was warm.

1319. Last year did you exceed it?—Last year was a pretty hot summer. It does not vary so much. I do not suppose we were anything over 87° or 88° all last summer.

1320. (*Chairman.*) Speaking purely from a manufacturing point of view, up to what temperature do you think it necessary to go?—I do not think that I could fix any temperature as being a necessary temperature. So many things tend to affect the question.

1321. (*Professor Petavel.*) Would the spinning go on all right if the temperature of the room was 65° or 70°?—No, it could not be done. I cannot see how it could be done and keep the water in the troughs at the heat necessary for spinning.

1322. (*Professor Lorrain Smith.*) If the water were kept at the right temperature it does not matter about anything else?—Not so much.

1323. (*Professor Petavel.*) The temperature of the room is not such an important factor?—Not so much.

1324. It is the trough?—The trough.

1325. (*Chairman.*) What do you consider a necessary temperature in the room?—I could not state any definite temperature in the room. One trouble we have is the girls are very sensitive to draughts, and if it is cold in the room the girls feel uncomfortable.

1326. (*Professor Lorrain Smith.*) How low do you get down to in winter? You have given us the summer temperature?—Sometimes 75°, 76° and 77°.

1327. That is quite good working conditions?—Apparently yes. I do not see any difference it makes.

1328. (*Professor Petavel.*) That is dry bulb temperature—75° and 76° in the winter?—Yes, dry bulb.

1329. Four degrees of difference?—You would hardly have four, then—three.

1330. (*Chairman.*) Have you any means for heating the room, if necessary? If you should consider it necessary to make the room hotter than it would be without artificial means, have you any such means?—We have none.

1331. Nothing?—Nothing.

1332. Then you can always keep it up to the temperature you want without heating pipes or heating radiators?—We have no heating pipes or radiators. I may tell you when you ask that question that we did put in heating pipes to force the air into the room in order to make the air dry, but we found it was no advantage to us and we took them out.

1333. About your floors: what methods do you take to keep the floors as dry as possible?—We have no methods of keeping the floors dry further than sweeping.

1334. Are there no drains to take off the water?—Yes, there is on the front of the frames and down the side of the frames, and we have the floor of the room slightly concave. The place where the girls stand is a little higher than at the foot of the frames, so naturally the water tends to run off.

1335. Does the water run off satisfactorily?—It does.

1336. You do not have pools on the floor?—No.

1337. Have you any splash guards?—None.

1338. Have you tried splash guards?—We have, and found the workers objected to them. We had them on at one time and had to take them off again.

1339. What was the ground of objection?—Interfering with their work. They said they were not able to get at their work. Some of them complained that their arms touch the splash boards—this part of the arm (*indicating*). They said it raised sores on them with continually working. We had them in various materials. We had them in metal and india-rubber, and we had them to move backwards and forwards, but we have none on now.

1340. What was the space between your frames?—I could not just say. We are an ordinary pitch. I think the pitch of the middle would be about 9 ft. 6 ins.

1341. I do not mean that. I mean in the alleys?—I could not exactly tell you what that space would be.

1342. That affects the question very much. Whether they can work with splash guards depends on the amount of space there is in between?—Ours is normal. It is not unduly close. We would run the average width of pass of any of the places.

1343. What ventilators have you?—Mechanical ventilators. We have extracting propeller fans and we have cased indrawing fans.

1344 Then you have what they call plenum in-blowing?—A measure of plenum.

1345. You are working the two together?—Yes, in conjunction, but I would not call it plenum because the capacity of the ingoing would not equal the capacity of the extracting fans.

1346. Where are they placed?—In the centre of the room. It is conducted to the centre pass by a tube and it is divided and runs up and down the pass. The air escapes through holes in the tube. The idea is to get even distribution of the incoming air all over the room.

1347. Then you have a plenum fan on the roof and some in the centre, and the air is distributed by a trunk. Is that so?—Yes, but the extracting fans are only window fans.

1348. (*Professor Petavel.*) Is the air heated in winter?—Not heated. That is where I said we tried to heat, and we found it no advantage, so we took the heating out.

1349. (*Chairman.*) It is distributed by trunks. Of what dimension are the trunks?—I should say it is either 21 or 24-inch cased fan for the air coming in. The trunk would be 21 or 24 inches.

1350. Is it the same at both ends?—No, the trunk goes to the centre of the room. It is full diameter, and then it branches off one to the right and one to the left, and it gradually tapers until it comes to about a 9-inch trunk at each extremity.

1351. That is with a view to equal distribution?—To equal distribution.

1352. You said your workers objected very much to draughts?—Very much. They are very sensitive to draughts.

1353. What precautions do you take to prevent draughts?—Well, the main precaution was conducting the air into the room so that it would come in no strong current in any particular part. I do not think we have any draughts.

1354. Distribution by trunks?—Yes.

1355. Where are the apertures, the openings?—The apertures are above the centre, tending upwards.

1356. And I take it current of air does not fall directly down on the worker?—No.

1357. You try to diffuse the air before it comes on the workers?—Quite so.

1358. Do you do so with average success?—Fairly.

1359. Coming to exhaust fans, do you always keep those running?—We always keep those running.

1360. You keep both running?—Both running.

1361. Where are the exhaust fans placed?—At the top of the windows, in the top panes of the windows.

1362. How high from the floor?—They would be 12 feet from the floor—the bottom would be 12 feet from the floor.

1363. How high is the trunk?—About the same height. The trunk falls coming down from the fan. The centre of the trunk over the pass where it is distributed, I should say, would be about 9 feet from the floor.

1364. It would rather on the face of it appear as if there was short-circuiting between the trunk and those fans; that the upper part was ventilated and not the lower part?—Well, I do not think so. I see your point.

As a matter of fact the extracting fans would take not double, but almost double, the air out of the room.

1365. It seems to me on the system you have explained that you would have the cold air in the upper part of the room and the heated air in the lower?—Yes, but the air that we are introducing into the room would not be half the quantity, or about half the quantity we are extracting out of it, therefore I should consider the air would come from all parts of the room.

(*Chairman.*) Yes, that might be so.

1366. (*Professor Petavel.*) That would make a difference—The idea I had in putting in the little plenum was to ensure a fixed quantity of fresh air coming continually into the room.

1367. (*Chairman.*) Speaking generally, are your workers in the spinning rooms a healthy lot of workers?—I consider they are a very healthy lot of workers.

1368. Do you keep any records of sickness?—No, we do not.

1369. Can you say at all from your wage books?—The absence from the wage books would not always be due to sickness. We have no means of determining whether it is sickness, carelessness, or laziness.

1370. Speaking generally, you consider them to be healthy?—We consider them to be a very healthy lot, nor have we had any complaints of the conditions under which they are working.

1371. (*Professor Lorrain Smith.*) You spoke about them having sore arms when they work with the splash guards?—Yes.

1372. Was there much of that?—It was like little irritable lumps, and sometimes I have seen scabs form on the under part of the arms.

1373. Was that common?—Well, in my experience it was not common, because we had not a great number of these splash boards on, but I have seen it where they were on.

1374. Was that one of the main reasons of their withdrawal?—That was one of the objections that the girls had to them—that it hurts their arms; and another was that it interfered with their work. They said they could not get at their work to do it as well. I would not say that was the main reason. They objected to them altogether. As far as I, personally, was concerned I endeavoured to get them introduced and I persevered, but the girls would not work with them.

1375. Then it has also been stated that they suffer from sore feet. I suppose they work barefooted?—Yes, all barefooted. I have had no experience of that.

1376. (*Mr. Ewart.*) One person giving evidence here said that spinners complained and showed their sore feet due to, I think she said, the chemicals used or the materials used in the water in the troughs. It was conveyed to me that she thought it was soda or something of that sort.—We put no material in the troughs, and I never heard a complaint.

1377. Do you know any one who uses soda?—I know of one firm where there is chemical used, but I do not know the chemical.

(*Mr. Ewart.*) Yes, that is phosphate.

1378. (*Professor Lorrain Smith.*) I understand you to say that you have had no experience of workers complaining of sore feet?—Never heard a complaint.

1379. It was sore arms?—Yes.

1380. (*Mr. Ewart.*) Did those sore arms occur amongst girls of ordinary height or was it confined to the smaller people, the doffers who might rest their arms on the top of the splash boards?—I could not answer that question, because I do not recollect. It is a long time since we had those on. I just recollect the fact of the girls holding up their arms and showing where it hurt them, but I could not tell you whether it was the smaller or the bigger hands that it occurred with.

1381. (*Professor Petavel.*) When you get those high temperatures in summer, 86° and 87°, do you occasionally open the windows?—We have the windows open all the time. In the winter-time we have great difficulty in keeping the windows open. I insist on the overlooker doing it, but the girls themselves close the windows.

1382. What extent of opening does that mean—half or what?—No. They are not sliding windows, they are hinged ventilators; and in the winter time it would not be open more than a couple of inches, so that the current of air would go along the ceiling. In the summer-time it might be open full. That might be, say, nearly 90° the fall down.

1383. That would open a quarter of the window surface?—It opens the whole width of the top of the window.

1384. (*Mr. Ewart.*) The top is about a quarter?—Yes, roughly about a quarter.

1385. (*Professor Petavel.*) It would be a quarter window?—If it was open clean away it would be a quarter, but we cannot take it right down at right angles.

1386. Chemicals were referred to. Do you think it would be possible to spin the yarn with water at a much lower temperature by the introduction of any suitable chemicals?—I cannot speak from experience of that at all. I have not tried it.

1387. But it has been tried?—It has been tried.

1388. What temperature of water do you actually use?—I should say the temperature in the troughs would run somewhere from 120° to 150° or 160°. It may be 170°.

1389. Fairly high. A high temperature is necessary for coarse yarn?—It is necessary for coarse yarn.

1390. And a lower temperature for fine?—It may be. There is a limit beyond which you cannot spin.

1391. (*Mr. Ewart.*) I was going to ask that. I suppose in your place it is left to the spinning master?—It is left to the spinning master.

1392. If he sees the spin is good he leaves things alone?—There are many things, I should say, that regulate that point. A different season's flax would be a pertinent factor in the heat of the water. I have come across season's flax which it would be impossible to spin unless the water is very hot. Another season's flax might want less. If we make beaded yarns we spoil everything. That is a yarn that is unworkable in looms. That spoils all our materials. We must keep outside that point.

1393. (*Professor Petavel.*) That occurs when the water is too cold?—When the water is too cold.

1394. (*Professor Lorrain Smith.*) Does anything else affect the efficiency of the water but the temperature? Some people have spoken of softening the water or the difference between soft and hard water. Have you experience on that point?—It might affect it a little. We generally use soft water for our work. Our water is not of a hard nature, but we put it through a water-softener for spinning.

1395. You prefer the soft?—We prefer the soft.

1396. Is the difference marked?—I could not say exactly what the difference would be. We generally think the softer the water the better the results. In fact, most places trap their condensed water from steam to use it for spinning troughs.

1397. (*Mr. Ewart.*) It has been suggested to us—I do not say it was given in a very positive way—that if spinners were to select their water with sufficient care they might spin at a great deal lower temperature. I think that was more or less a statement, but the suggestion really was that if it was sufficiently well selected they might spin without any heat at all through cold water. Do you know anyone in this country who spins with cold water?—I tried it myself. There is one firm that is spinning with cold water. I put an installation in to try it, and we had to give it up.

1398. Is that an actually cold trough?—A cold trough. It necessitated a great deal of trouble. The rove had to be steeped and be kept steeped.

1399. Is that going on still?—I think it is. I am not absolutely certain, but I think it is. Many firms have made experiments, but they all gave it up except the one place where it was introduced.

1400. (*Professor Petavel.*) Was that coarse or fine?—It would be medium. I should say the same numbers that we are on.

1401. Twenty to 70 is a medium range, is it?—No, I would say from 50 to 80 would be medium; 20 to 70 would be coarse.

1402. (*Professor Lorrain Smith.*) Was that steeping in the cold water efficient?—One difficulty was to keep your supply steeped. You might have it over-steeped and it was a great trouble to get it done that way. What we felt most was the girls spinning at those frames ran away and left them. We could not get a spinner to go to them. It was too cold; and the cold water seemed to have an effect on them. I persevered with that for four or five months and it was a considerable expense. We had to alter those things and then we had to give it up.

1403 (*Professor Petavel.*) That was during the summer?—No. I cannot tell you what period of the year. Certainly part of it was in the summer. I tried it 12 years ago at least.

1404. Do you attach any importance to the actual humidity in the room. Is there any marked difference if the bulb exceeds four or five?—No, I do not think there is.

1405. It is more or less accidental or incidental?—Yes.

1406. Do you have bad spinning days as they have bad weaving days?—We have.

1407 Due to?—I do not know what it is due to.

1408 (*Mr. Ewart.*) Is your yarn fine enough to be affected by a draught?—No, none of our yarns would be fine enough to be affected by a draught, but I have spun fine yarns that would be affected by a draught.

1409. (*Chairman.*) You have told us you have no draught?—It does not affect us now, but in fine spinning, 180 up to 300, it is very sensitive.

1410. (*Professor Lorrain Smith.*) You do both spinning and weaving?—Both spinning and weaving.

1411. With regard to this interesting point about the bad days. Are the bad spinning bad weaving days equally?—I do not know that; I cannot tell you.

1412. It is a difficult question to define, these bad days?—There are many things a man in my position has not time to go into because there is so much else to do. These are side issues.

1413. (*Chairman.*) Just one point about the clothing of the workers. What arrangements do you make about their depositing their clothing?—We have some cloak rooms. We have not all our place fitted up with cloak rooms, but we have some, and when we introduced them we had great difficulty in getting the girls to put their clothes in the cloak room. After we persevered we found that difficulty was overcome, and there is not any objection now

1414. Do the spinners as a rule put their clothing in which they come to the mill in the cloak room?—Yes.

1415. Do they change their clothing before going to work?—No, it is a slight change. It is only their over-clothing they change. Their shirts and blouses they leave on. It is principally their skirts and shawls

1416. Do they as a rule change their blouses?—Not their blouses; their skirts and shawls. One great difficulty we had when we started the cloak rooms was the question of thefts. We were continually put to trouble by some of the girls' shawls and other apparel being stolen. We do not allow the girls into the cloak room at all. We arrange for a number of doffers to collect and distribute the clothing. Immediately they come in at the meal hour, and when they are going out, five minutes before that we let them carry the clothes down to their places at the stands in order to prevent theft.

1417. Although you do both spinning and weaving perhaps you are not in a position to give evidence as regards weaving?—Not regarding the weaving.

The witness withdrew.

Mr. JOHN BARBOUR MORRISON called and examined.

1418. (*Chairman.*) What position do you hold?—Manager of the Wolfhill Spinning Company, and partner in Morrison and Metcalfe.

1419. Will you tell the Committee what practical experience you have had in regard to spinning rooms?—In what way do you mean?

1420. Does your experience consist simply of supervision, or have you had actual practice in the early days?—I have come right through all the departments of a spinning mill, and have been in charge of spinning rooms during the time I was serving my apprenticeship.

1421. What class of yarn do you manufacture?—Well, both warps and weft; coarse warps and fine warps and fine wefts; all sorts except dry spuns.

1422. (*Professor Petavel.*) You cover the entire range?—Yes, except dry spuns and the very finest.

1423. Up to what?—One hundred and forty

1424. (*Chairman.*) How many rooms have you?—In Wolfhill Spinning Company we have three spinning rooms.

1425. About how many spinners are employed?—About 118 spinners, I think, in Wolfhill. I could not answer for Grove Mill; about half that quantity, say 60.

1426. I suppose they will vary in ages from young persons up to adults?—Yes, we have more young spinners now than formerly, although I was talking to one the other day, and I think she is nearly qualified for the old age pension.

1427. She is a spinner?—Yes.

1428. They come in as young persons, do they?—Yes, children, half-timers, nearly always, and go right through.

1429 Do the spinners, from your experience, work on to an advanced age at that rate?—They do. Sometimes they get married and leave work altogether, but generally they work on. There were spinners spinning in the mills when I went to serve my time, and they are there yet. That is a long time ago

1430. Do you consider spinning to be a healthy occupation or otherwise?—I think it is one of the healthiest occupations in the mill. The reeling is perhaps as good or better, but it is a pretty healthy occupation. The average attendance in the spinning room is just as good as in the other rooms.

1431. Naturally they work in a very humid atmosphere?—Yes, it is humid.

1432. Arising, I suppose, from the spray from the flyers?—I would not say that from the heat of the troughs as well and the drop pipes. We require warmer water for some yarns than for others.

1433. You say the humidity arises from the trough?—Yes, some of it.

1434. What measures do you take to confine it?—We have trough lids provided with all the latest improvements recommended by H.M. Inspectors.

1435. What would you consider the latest improvements?—There is a dip at both back and front of trough to keep the steam in as much as possible.

1436. You still consider that some of the heat and moisture escapes?—Yes, a little. In the mornings when the rooms are being got ready for work, you will notice steam rising from the troughs

1437. Have you tried any local exhaust for carrying away the steam?—You mean attached to the frames.

1438 From the troughs?—No, I have not tried that, but I have heard it was tried not very satisfactorily.

1439. What is the heat of the water on an average in your troughs?—It runs up to 180°

1440. Then do you consider that to be one source of moisture?—Yes, there is a little moisture gets through. You cannot keep out of it.

1441. I suppose there is some also from the spray?—Yes, it is a damp process all through. The rollers are wet.

1442. As the flyers go round there is a spray?—Yes, some moisture drops off.

1443 That wets the workers?—It wets the floor and the workers, they wear an apron

1444 Do they wear anything over the chest?—Yes.

1445 What do they wear?—There is a bib attached to the apron.

1446. Do you find them wear those?—Some of them do, but there is a difficulty. They turn them down.

1447. What should you say is a necessary temperature to maintain in your spinning rooms?—It would vary. Different years would require different temperatures.

1448. Different years?—Yes.

1449. Why should it vary from year to year?—Different years' flax. Some years' growths are harder to draw and consequently require warmer water.

1450. Is that on account of different flax?—Yes.

1451. But I am not talking of water. I am talking of the temperature of the room. What should you consider to be a satisfactory temperature of the room?—Well, I do not think you can fix it very well. Do you mean the wet bulb?

1452. Yes?—The wet bulb runs up from 74° to 82°. One room averaged 76° for a month, I took it out that it averaged 76°.

1453. Have you any means of increasing the heat artificially?—No, we were not allowed to. At one time we had a steam pipe left uncovered, which was used for manufacturing purposes. The Inspectors insisted on it being covered; this was done, and we had more humidity in the room afterwards.

1454. What ventilators have you?—We have encased fans connected by ducts to the window in two of the rooms. In the other we have ordinary propeller fans working in the windows. The encased fans are attached to the ceiling in the centre of the room and force air through the duct outside the building into the centre of the room and push it out through the window.

1455. First of all, can you tell us the cubic capacity?—I could not tell you, but we did go into it when we were putting the ventilation in the room so as to clear the room out pretty often. I could not just give you the figures offhand.

1456. How many fans are there?—Three in each room.

1457. Are they exhaust fans?—Yes, they are exhausting from the centre of the room and forcing air out through the duct. Mr. Williams recommended that, and we thought it would be better, and it is better.

1458. That is, you have three fans in the roof somewhere?—Yes, three attached to the ceiling.

1459. And they are exhausting from the room?—Yes.

1460. And discharge?—Through the window.

1461. By pipes, you mean?—By tube, yes.

1462. Why not through the roof?—There are some storeys above.

1463. Yes, I quite understand. So you discharge through the window?—Yes.

1464. What are the inlets. Have you any air inlets?—The windows. We open all the windows in the room. To-day it is pretty warm. We had to have the windows all pretty well open to-day.

1465. What about your floors? What precautions do you take to keep those floors as dry as possible?—We have them all laid with white tiles and with channels in the side.

1466. To let the water drain off?—Yes, the floors are dry. At least there is no water lying on them.

1467. Have you ever used splashboards?—We have.

1468. Do you use them now?—We use them on some coarse frames.

1469. Up to what pitch?—Up to 2¾-inch.

1470. Have you ever tried them on other frames?—No. We have difficulty in getting the hands to work at them, if we have them. They do not like them.

1471. The workers do not like them?—No, they complain of getting hurt—hurting their arms. They keep them pushed up sometimes. It is difficult to get them to keep them down in their place. At these particular frames we have difficulty. Whether it is because the work is coarser or because of the splash boards, I do not know, but there are complaints. We are constantly fixing them.

1472. What about the clothing of the workers? What arrangements do you make with regard to that?—We have not gone into that very much. We have a cloak room for the reelers, and we are making new cloak rooms in all new rooms. In the spinning rooms we are trying little cupboards in the pass.

1473. In each pass?—Yes, they are up from the floor.

1474. Is that inside the room?—Yes.

1475. Do you say you have cupboards?—Yes, little cupboards. They are not very satisfactory. We are going into the question of accommodation for clothing at the present time.

1476. I take it in rooms that have been erected since a certain date you have made cloak rooms?—Yes, but they do not use them.

1477. But have you made them?—Yes, in the reeling room. They do not use them at all.

1478. Your experience is they do not use them?—Yes.

1479. Are they constructed so that the workers can go in a continuous stream right through, or do they have to go in and out and meet each other at the door?—In the reeling room we have four or five compartments. They go in and come out.

1480. They go right through?—No, they have to come out at the same door.

1481. Do you think there is any crowding of the workers?—No.

1482. Or any delay in hanging their clothes up in the cloak room?—No, but they do not like to keep their clothes there. Some workers are more particular than others where they keep their clothing.

1483. I think you said in some of the spinning rooms you have little cupboards?—We are trying them. We have only a few. The girls put their shawls in these, but very often they like to hang them on the side of the window if you would allow them.

1484. Are these cupboards arranged so that the moisture will not get at the clothing?—They are up above the ground.

1485. Is there any protection between the wall?—Yes, it is a separate cupboard altogether.

1486. (*Mr. Ewart.*) I would just like to ask the same question about cold water. It has been suggested that if the water were carefully selected spinners could spin either with very little heat or perhaps without any heat at all? If the water was selected?

1487. Yes, perfect water, whatever that perfection may consist in. Have you ever tried cold-water spinning?—Yes, years ago. Mr. Barbour had cold water for years, and it was most unsatisfactory. We had to pay the girls more to work at these frames than any others. They complained of the cold water dropping on them.

1488. Was it satisfactory?—No.

1489. Do you require any previous process?—No, in our case we did not, but I believe in another mill they have to steep the bobbins in water.

1490. In Barbour's patent they did not treat the bobbins?—No. They run the rove two or three times round pulleys.

1491. Through a cold-water trough?—Yes, absolutely cold and the water got a very bad smell in a very short time, far worse than bad water. The smell was very bad in the water, but I think that was got over by running water in at one end and out at the other.

1492. (*Professor Lorrain Smith.*) To keep it clean?—Yes.

1493. It really got dirty?—Yes.

1494. (*Mr. Ewart.*) It is the gummy matter fermenting?—Yes, it just has the smell of stagnant water. When I heard of this Committee I tried how much I could reduce the temperatures. I went round and took the temperatures of the troughs and tried to reduce the temperature, and the result is I had a lot of beaded yarn the next day.

1495. (*Professor Petavel.*) That is uneven texture?—Not drawn—lumps on it that pull out.

1496. (*Mr. Ewart.*) These gentlemen are anxious to understand thoroughly these technical points. I would not like to insult you by suggesting that you do produce beaded yarn, but could you give us anybody who could give us a sample of beaded yarn?—I could make beaded yarn quite easily. Beaded yarn is undrawn yarn.

1497. (*Professor Petavel.*) It is one place in the yarn where the twist has not gone through?—The twist runs up into the part that is improperly drawn, causing it to snarl up I can get you a sample.

1498. That occurs frequently when the temperature is not up?—Yes, we find it occurring in the morning sometimes, when the temperature of the water is too low.

1499. (*Professor Lorrain Smith.*) What was the difference in temperature that you had that produced this beaded yarn?—I reduced it about 10°. Some frames spun all right with the reduced temperature. Usually we keep the water warmer than is absolutely necessary to guard against beads.

1500. (*Professor Petavel.*) That is a serious defect?—You could not sell the yarn if it is beaded. No one wants it.

1501. Do you consider that the temperature of the room itself is of any importance, or is it simply accidental heat?—I think it is better when it is not too humid. We do not like it too humid

1502. You would rather have it cold than dry?—I would like the spinning room a little drier than we have it, but not cold.

1503. (*Professor Lorrain Smith.*) You made a remark that bears on covering the pipe. You said it was more humid when the pipe was covered than before?—Well, I can hardly explain it unless the steam pipe dried the air

1504. And you get a higher dry bulb temperature?—Yes, that is right.

1505. Even when you had the pipe uncovered?—Yes.

1506. You lost humidity?—Yes.

1507. You would like a higher dry bulb temperature for spinning?—Yes, we like the air pretty damp. It is always damp enough in the spinning room.

1508. After the pipe was covered you still had to run up the temperature and you found it was more humid?—This room was the top storey and had a flat roof. We keep the pipe uncovered because it was a cold room. Afterwards, when we put additional storeys to this building, we covered the pipe I think it depends greatly where your fans are what humidity you register. We have fans in the pass where air is drawn from; this is also where we have the hygrometer, consequently we are registering the humidity of the most impure air.

1509. (*Professor Petavel.*) But as far as the spinning is concerned in summer, for instance, instead of having 80° or 85° you would be quite content with 70° if you could get it?—Well, yes, we have 70° or 75°. We would like some humidity, of course. If we could have four or five degrees difference I would be quite satisfied.

1510. (*Professor Lorrain Smith.*) Then there is the question we have been asking the witnesses about the quality of the water in the troughs Some witnesses tell us it is an advantage to have soft rather than hard water?—Well, I should say it would be.

1511. Some even use steam for the troughs?—Yes Of course the water we use is not very hard—about 11 degrees of hardness, I think.

1512. Do you find any very definite difference?—No.

1513. Ordinary water is quite good?—Yes, ordinary water is quite good, but the purer the water, the less trouble you have with it.

1514. Is that from staining rather than from its effect on the yarn?—I think if your water is softer your yarn will be more uniform. I think it is better spun and everything else when your water is soft. At one time they tried an experiment. The water comes down from the mountains, and we got a tank and caught all the rainwater; but there was no difference at all.

1515. You have never tried chemicals?—No, I did try it for a week or two, but never in any quantity.

1516. (*Professor Petavel.*) You are not aware that it does any good? It does not make the spinning any better?—I have never heard of it. There is a place in Belfast where it is used, but I have not enough experience about it to say anything

1517. (*Mr. Ewart.*) Do you know of any disadvantage in using it?—Yes, it wears out the machinery considerably

1518. Do you know of any firm but the one using it?—No, and I do not know whether they use it now or not

1519. (*Professor Petavel.*) In the hot summer days if it was possible to open the windows more would there be any objection to it from the spinning point of view?—Well, you would not want a draught right on the frames. You must not have cold air coming on the warm frame.

1520. But it might be arranged?—I can tell you on some days, when expecting the temperatures in the rooms to be pretty low, I find them high; on other days, when I expect them to be high, they are low It is a funny business. It is according to the atmosphere outside. There is a considerable difference.

1521. (*Professor Lorrain Smith.*) Another subject you referred to was that the spinners found their arms were hurt with the splash guards?—Yes.

1522. Could you tell us a little about that?—I could not tell you much about it because these are pretty big frames and require large splashboards. The spinners when working at the bobbins knock their elbows against them sometimes. Very often you will find them pushed back, and they will tell you they do this because they get hurt They will show you a mark on the elbow

1523. (*Chairman.*) Do your spinners do both laying on and piecing?—Laying on, principally

1524. Do they do both?—They do.

1525. In which process is the splash guard most in the way—laying on or piecing?—I think practically the one is as bad as the other I do not think there is much difference

1526. Could you explain, so that we may have it on our minutes, the exact meaning of the piecing and laying on?—In piecing the spinner finds the end on the bobbin and puts it through the flyer eye and thread plate, then with the other hand she gets the end on the roller and connects them.

1527. (*Professor Petavel.*) That is piecing?—That is piecing. When laying on, she gets the end on the roller and twists it with her hands, stops the flyer and puts it on the bobbin

1528. And that is?—Laying on.

1529. That is a more expensive but better process?—Yes, you have to pay the reelers extra.

1530. (*Chairman.*) As far as your experience goes the splash guards would be in the way?—On the frames where we have the splash guards we do not lay ends

1531. It has been suggested to me in former years that splash guards are very much more in the way for the one process than the other process I wanted to know if you could tell us anything about that?—No, we piece the ends on these frames I am talking about. We have not any laying on in these frames

1532. (*Professor Lorrain Smith.*) Do your spinners ever complain of sore feet?—No. I never heard of sore feet. If there is an epidemic of ill-health the spinners seem to escape it far more than the reelers or others. You find it in the reelers sometimes, if there is anything like that, more than the spinners

1533. Influenza, say?—Yes, influenza.

1534. (*Mr. Ewart.*) I was going to ask about that question of ventilation. You replied that it depends on whether the extra air gets down on the frame?—Yes.

1535. That is, if there is a too plentiful supply of air striking the line of spindles, there will be breakages or bad spinning?—Yes

1536. That same draught would make the spinners uncomfortable?—It would, but they would not let you keep the window open.

1537. (*Professor Petavel.*) Has the draught any effect on the coarser counts?—A very strong warp yarn it would not have much effect on, but it has an effect on spinning generally We used to try experiments years ago of all sorts—the windows open at the bottom and at the top, and one room we liked better with the top windows open, and another room we liked better with the bottom windows open. We are working at that again to see which is best.

1538. (*Mr. Cummins.*) For instance, if the rollers were not in order, would that have the same effect almost on the yarn as the cold water?—Bad rollers?

1539. Yes?—Yes, if the frame was in bad repair.

The witness withdrew.

Mr. ALFRED ERNEST ADAMS called and examined

1540. (*Chairman.*) What position do you hold?—Manager of the Ulster Spinning Company, Linfield Mill.

1541. How many spinning rooms have you?—Five.

1542. Do they vary much in size or structure?—They are all exactly the same size, with the exception that in one room the height of the ceiling is 11 feet where the others are 12 feet to the beam.

1543. And in the different rooms do you spin different counts?—Yes.

1544. Can you tell us what counts you spin?—In what we call our two coarse rooms we have out of 38 frames about 24 or 26 frames of tow, that is to say, coarse yarns from 18's up to 60's, and the remainder of the frames would be 50's to 65's line.

1545. And in the coarse rooms, I take it, there will be probably more moisture, more water, about than in the fine rooms?—Yes, there is.

1546. I suppose there would be more moisture thrown off from the flyers?—Yes.

1547. (*Mr. Ewart.*) You did not mean to say that 60's, 65's, were your fine numbers?—Yes, in the coarse rooms.

1548. You would count those coarse numbers?—Yes.

1549. (*Professor Petavel.*) Then you have some fine rooms?—Yes.

1550. Running what kind of counts?—We have them up to 170's.

1551. You cover most of the range?—Practically all.

1552. (*Chairman.*) In all processes the rove has to pass through troughs?—It has, through the hot water.

1553. Does the temperature of the water vary much for the different counts?—It does, but of course that all depends on the material.

1554. And approximately what temperature would you have in the troughs for the coarser counts?—It would be practically nearly boiling point.

1555. And in the finer counts?—In the finer counts it would not be quite so high. I could not say what temperature it would be, but not quite so high.

1556. And in both the coarse and fine rooms do you adopt the same methods for confining the heat and the steam in the troughs?—Yes, we have practically the same thing.

1557. Will you tell us what system you have?—I can show you a sketch of our troughs. That is the roller (*indicating*). It comes down through *there*. That is the actual size of it from half an inch to five-eighths, and this is a dipper coming down. There is also a dipper on the back lid of the trough coming down into the water.

1558. (*Professor Petavel.*) What material are those made of?—Waney pine. There is a dipper *here* attached on the back lid of the trough. On the front lid we have a dipper one and three-quarters inch in breadth.

1559. (*Chairman.*) This is the rove coming down here, and it passes down here and goes away to the flyers?—Yes.

1560. How high does the water come in the trough?—This here would catch the water. The water would be up to about that level (*indicating*).

1561. At any rate, these dippers go below the water?—They do, and the trough lids are also overlapped here (*indicating*) to prevent any escape of steam.

1562. What are the troughs made of?—They are made of pine.

1563. (*Professor Petavel.*) Where is the heating pipe?—In the trough.

1564. At the back of the trough somewhere there?—Yes. Of course the steam pipes are all covered down to the troughs, with the exception of the fittings just where they immediately join the troughs. There is brass beading put on the edge of the trough five-eighths or three-quarters of an inch.

1565. (*Chairman.*) Do you consider that the steam is effectually kept in by those covers?—I do.

1566. And do you think that much heat radiates from the surface or from the sides of the troughs?—No, there is not.

1567. If you were to put your hand on the wood would you find it hot?—Well, it would be a little hot, but you could keep your hand on it all right.

1568. Would it be much hotter than the atmosphere of the room?—No, it would not.

1569. Then do you think that the use of hot water in the troughs is a serious cause of additional heat in these rooms?—The extra heat you have in the troughs.

1570. Yes; I mean we want to get at what causes the sometimes rather excessive heat in these rooms?—Yes.

1571. Do you think that is one of the causes—the heat from the troughs?—Certainly; perhaps it would affect the temperature to some extent.

1572. It raises it to a certain extent?—Yes.

1573. But as a matter of fact you have done all you can to prevent that?—That is just my point. Speaking for my own firm, we have done everything we possibly can to confine the steam.

1574. To confine the steam and the heat?—Yes.

1575. Then the floors are, I suppose, wet?—In the coarse rooms the floors are damper than in the fine rooms.

1576. What precautions do you take to see that the water does not accumulate on the floors?—We have two sweepers in each room, and the floors are constantly brushed and kept dry.

1577. How are they constructed?—The floors?

1578. What is the material?—Twelve-inch Chester tiles.

1579. Are there any drains?—Yes, there are two drains in the middle of the room.

1580. Are they on the slope?—They are. The tiles are laid on the slope, and the gutter of course on the spinning frame is also tapered, with a fall to the drain.

1581. What precautions do you take to prevent the clothing of the spinners getting unnecessarily wet?—We have no difficulty whatever with regard to clothes getting damp or wet. They simply hang their clothes against the wall. In some of the rooms we have put up racks for them to hang their clothes on. The walls of the spinning room are quite as dry as these walls are.

1582. But I was talking of the clothing while they are at work. What precautions do you take to prevent the clothing getting wet while the spinners are at work?—I am trying to point out to you that the clothes are not wet. We do not find any difficulty in that respect.

1583. But is there not an incessant spray thrown off from the flyers?—Our passes are round the side of the room, not up the middle, and the clothes are away five feet from the frames.

1584. I am talking of the clothing on the people while they are at work?—Oh, I beg your pardon! We have supplied them with waterproof aprons or skirts with a bib attached, and that waterproof apron meets right round with a bib to cover the chest.

1585. Do you find they wear the bib?—We insist on them wearing them.

1586. (*Mr. Ewart.*) Wearing the bib?—Yes. Of course I will not venture to say they all do it, because I notice a great number of them tear their bibs off; at least a percentage of them do. Occasionally I have to make a raid on them and send them down and make them get their bibs on again.

1587. Have you tried splash guards?—We have.

1588 Do you like them?—The workers objected to them

1589 On what ground do they object?—They complained of pains in their shoulder blades by reaching over the splashboards in order to piece the ends. Another thing was the disadvantage of having to reach forward to the creel on account of the splashboard projecting so far out from the frame They were not able to get close in to reach up to the creel. The result was a lot of our workers turned out and would not work. In fact, I believe it was Mr. Osborne who paid us a visit on one occasion and the workers spoke very strongly to him on the matter

1590. How about the temperature? What do you consider a good temperature from a spinning point of view?—Well, it is a difficult question to answer, but I would think that an average of about 76° in the wet bulb or so would about cover all requirements

1591. Seventy-six degrees on the wet bulb?—Yes, 76° or 77°.

1592 Can you tell us about what temperature you get in the winter?—We do not vary much.

1593 You do not vary summer and winter?—No.

1594. How do you prevent the variation?—Well, of course on a good day we would ventilate the rooms more either in summer or winter.

1595. In summer you ventilate more than winter. Is that what you mean?—It all depends on the weather, because of the dry winds that affect particularly the fine yarns. Even if you would open the windows you would not have your back turned before the workers would have them closed again, for the reason that in the fine work the dry air dries up the rollers so quickly that the ends go down, with the result that the spinners would have perhaps three ends to put up as against one they would have to put up if the windows were closed.

1596. But you say you keep pretty much the same summer and winter?—Yes, pretty much the same. We try to keep our temperature as low as we possibly can.

1597. How do you do it?—By the ventilation by the windows. We have put in new windows in four of our spinning rooms and we find those windows have been a great benefit to us in the reducing of the temperature and ventilating the rooms better.

1598. Have you any fans as well?—We have. In the two coarse rooms we have fans; that is where we find them necessary

1599. Are they plenum fans or exhaust fans?—Just ordinary exhaust fans.

1600. (*Professor Petavel.*) Are the windows of special construction?—In the ordinary pull up and down windows, when the window was pulled down, there was a current of air passing right down to the frames. In the new style of window we have the bottom portion open inwards so that the current of air passes upwards. The middle portion is stationary and the top is on a swivel.

1601. (*Chairman.*) I was going to ask you that question, but at any rate you appreciate that so far as the comfort of the workers is concerned there is a difference between ventilating and a direct current falling on the workers?—Undoubtedly.

1602. You try to prevent a direct current on the worker?—Yes.

1603. And doubtless you try to prevent a direct current on the yarn?—Yes, on the material

1604. In regard to the water used, have you ever tried to use any chemicals in the water?—No, we have never tried chemicals.

1605. Have you ever tried cold water?—We have.

1606. With what result?—Not very satisfactory It did not improve the yarn. In fact it made the yarn worse, and we have had the difficulty of beaded yarn. It was only an experiment that we made.

1607. (*Professor Lorrain Smith.*) What did the workers say about it?—About the cold water?

1608. Yes?—They were not in favour of it. They complained of a difference in the stand where the cold water was used, and having to bring the rove through the cold water. They did not like it at all. It was only an experiment we tried for a short time.

1609. (*Chairman.*) At what age do your spinners come into the spinning room?—They come in half-time, when they are twelve years of age

1610 And as a rule do they continue work in that department or do they go to other departments?—They generally stay in that department We have a system of bringing them on from our own school, and we bring them in as soon as they are of age We give the preference to the scholars attending our school, and as a rule when they are brought into one particular room, they generally stay there until they get married or leave for other reasons

1611. Have you any spinners that have worked there from children right up to manhood or womanhood in your spinning room?—A great number

1612. Up to how many years?—Some of them twenty years

1613. People who have worked twenty years in those rooms?—Yes

1614 Do you consider them to be a healthy class of workers?—Yes, in my opinion they are exceedingly healthy.

1615 How do they compare with other departments?—The spinners?

1616. The spinners?—Very favourably. In fact, I think the percentage of sickness amongst them would be very low.

1617. (*Mr. Ewart.*) You have spoken about the evil effect of draughts upon the yarn?—Yes.

1618. You have also spoken about the cold water difficulty?—Yes.

1619. (*Professor Lorrain Smith.*) You say you like a temperature of 76° wet bulb?—I merely say that as an approximation—anywhere about 76° or 77°.

1620 Does it matter very much what the moisture is?—It does to a great extent, especially with the finer counts.

1621. You have to be very particular about the wet bulbs?—We have When you come up to leas of 160 and 170 it is a particularly delicate thread. That is in ordinary weft-spinning.

1622. It does not matter so much for the coarser counts?—Not so much for the coarser counts.

1623. (*Professor Petavel.*) Have you been able to trace any effect of moisture on the air in the coarser counts? Is it any better when the room is very moist?—In the coarser numbers?

1624. Yes?—I do not see that we could spin very well if we had not a certain amount of moisture. Of course, we do our best to confine the steam, but there always will be a certain amount escape into the atmosphere.

1625. Someone was telling us a short time ago that it was actually better when the air of the room was not too moist. Would you agree with that?—Yes

1626. (*Professor Lorrain Smith.*) Hot, but not moist heat?—We have found that same thing especially in winter time when you have a dark, dull, gloomy sort of day with a good deal of moisture. It really has a depressing effect on the work.

1627. Then you would heat up the room with the dry heat rather than the moist?—Yes.

1628 Does that hold for both the course counts and the fine?—We are not affected to the same extent in the fine numbers. We would not be affected with the extra humidity the same way We would not feel it.

1629. The spinning would go on quite well with the extra humidity?—It would.

1630. And it would go on if you dried the air in the same way?—No, you see we require the humidity and the spinning is always better.

1631. (*Professor Petavel.*) Do you know about how many degrees you want between the two bulbs—what do you consider best?—Well, we generally get about four. I think if we could get about four it would be very satisfactory. We always keep the two degrees difference between the wet and the dry, and, of course, a great deal depends on the weather. Sometimes you might get six degrees at one part of the day and perhaps at another time only three. It varies up and down

1632. (*Chairman.*) Do you keep records of humidity?—Yes, we send on the returns every month to the Home Office, and we keep a copy.

1633. You know that certain spinners are exempted from keeping records?—Is that on account of them having a difference of four degrees?

1634. Yes?—We have never applied for that.

1635. You are not one of the firms exempted? —No.

1636. In what class of goods would you expect that condition to prevail?—Well, I really could not say.

1637. You do not know how many have applied for that exemption?—No, I do not. I have never heard of any.

1638. (*Professor Lorrain Smith.*) Do spinners ever complain of the temperature?—Never.

1639. Or the heat?—No.

1640. (*Mr. Ewart.*) Have they ever complained of the cold?—Yes, they would very often. In fact if there was the least draught of air coming in they would have a little shawl tied round their head and give you to understand that they did not want the windows open. In fact, as I have already said, they would turn round and close the windows. When they get the overlooker at one end of the room they will close the windows at the other.

1641. (*Professor Lorrain Smith.*) Of course draught would naturally be less felt if the room was not so hot. It is cold air coming into a very hot room?—Yes.

1642. (*Mr. Ewart.*) Have you arrived at any reason why increased ventilation or a larger difference between the wet and dry bulb thermometers would affect the spinning?—Well, I have not studied the matter very closely.

1643. You used the expression that the fine yarns are very sensitive?—Yes.

1644. I wanted to ask, for the benefit of these gentlemen, what you mean by that?—Well, so far as the fine numbers are concerned, if you have a drying wind or air coming into the room directly on to the frames, it dries up the rollers, with the result, as I have already said, that the ends fall, the yarn breaks, and in that case the spinner has got extra work to do in order to keep the ends up.

1645. How soon would that effect appear after the window was open beside a frame?—Less than five minutes.

1646. (*Professor Petavel.*) And do you consider the temperature of the room itself of equal importance? With a high temperature in the room have you noticed distinctly that the spinning is less good?—I have not.

1647. You mentioned 76° wet bulb as being a suitable temperature. Would not the spinning be equally good at 70° if there were the right degree of moisture?—No. I do not believe it would.

1648. (*Professor Lorrain Smith.*) If the bulbs were not far apart at 70° would not it do?—Well, we would not have the same results in the spinning. It would certainly be detrimental to the spinning.

1649. (*Professor Petavel.*) In what way? More breakages or worse quality?—More breakages and consequently less turn-off.

1650. (*Mr. Ewart.*) Would you have beading if it was brought down to 70° wet bulb?—Yes, we would be inclined to have beaded yarn.

1651. (*Professor Petavel.*) Even with the water in the trough as hot as it was before?—Increasing the heat of the water would certainly be preventive, because it softens the fibre and makes the material more easily drawn; but if you have the cold air outside, of course it naturally affects the yarn from the time it leaves the trough until it gets down on to the bobbin.

1652. (*Professor Lorrain Smith.*) Beading may take place at that stage of the journey?—Yes, after it leaves the trough, certainly.

The witness withdrew.

Mr. T. JACKSON GREEVES called and examined.

1653. (*Chairman.*) What are you?—A director of the Portadown Weaving Company, Limited.

1654. Is that managing director, shall we say?—Yes, one of the managing directors.

1655. How long have you had experience in regard to the management of weaving sheds?—About 16 years.

1656. How many sheds have you at Portadown?—We have two rooms under one roof.

1657. Any others besides that?—No.

1658. What class of goods do you manufacture?—Mostly linen cambric.

1659. Do you consider artificial humidity is necessary for satisfactory weaving?—Yes.

1660. Have you had any experience of weaving without artificial humidity?—No, except for a small test which I made.

1661. How long ago would that be?—About a week ago. I, of course, know what it is to lose humidity. I know what it is for the shop to get a little bit dry.

1662. Do you know if, from the earliest days of power-loom weaving in Ireland, artificial humidity has always been used?—Certainly for linen cambric. It was even found to be necessary for hand-looms before power-looms came in.

1663. I suppose there is hand-loom weaving up to the present day?—Only in the very fine goods.

1664. How do they get humidity in the hand-loom weaving?—With earthen floors generally.

1665. From the moisture in the floor?—Yes. On some occasions they water the floor with salt and water to keep it moist.

1666. Have you given attention to the question of what relative humidity is necessary for weaving cambrics such as you manufacture?—Yes.

1667. Would you tell us what conclusion you have arrived at?—I believe for ordinary weather a wet bulb temperature of 70° and upwards with 90 per cent. relative humidity is required.

1668. That would be?—That is, roughly, two degrees difference at 70°. Perhaps I should put it in another way. I believe we require to get to a temperature of 70° to get an efficient weave under the present humidity limits.

1669. Can you keep your temperature— —

1670. (*Professor Lorrain Smith.*) I would like Mr Greeves to finish. Under present what?—Under present rules, which only allow us to go to two degrees of difference between the wet and dry bulbs. Do you follow what I mean?

1671. (*Professor Petavel.*) Yes, I think so. You think it is purely a question of relative humidity and not of temperature at all? Is that your view?—No, I think it is very decidedly a question of temperature also.

1672. So, however near you could go, you would claim you could not weave below a certain temperature? —I believe that is very certainly the case.

1673. What is the minimum temperature?—Well, I would say somewhere above 70° for the best condition.

1674. Wet bulb?—Seventy degrees wet bulb, but I have only got up in my tests to 73°. I have been improving with every extra degree of temperature. I have improved up to 73°.

1675. (*Professor Lorrain Smith.*) But when you spoke about present rules you were contemplating another possibility; say that you had a difference of one degree?—I believe if we were allowed to work with only one degree of difference it would be a very great advantage to us. I intended to bring that before you.

1676. How would that affect the minimum of 70°? —Well, I am not able to say whether exactly one degree at 70° would give us more efficient weaving or not, but I do believe that less than two degrees at 70° improves matters. I think I can give you some figures for that.

1677. (*Chairman.*) Have you any difficulty in keeping your temperature up to 70° in winter?—I could read you some winter temperatures, if you like.

1678. Yes, if you would?—I suppose we had better go to the depth of winter—December.

1679. Last year?—Shall I take the 1st December 1911?

1680. Yes?—Our evening readings were 77°, 74°, 71½°, 72½° 72½°, 72° and 73°. I am skipping Sundays.

1681. (*Professor Petavel.*) What are those—successive days?—Successive days, yes. Those are the evening readings.

1682. (*Professor Lorrain Smith.*) Of the wet bulb?—Of the dry bulb.

1683. (*Chairman.*) At what time are those taken?—These are taken for me last thing at night.

1684. That would be the hottest time in the day, would it?—Well, it would not be much higher than that. It is practically the hottest time.

1685. (*Professor Petavel.*) What are the morning readings on those dates?—The next morning was 64°, 61½°—then I skip Sunday, and come to the next morning—64°, 62½°, 63½°, 63°.

1686. (*Professor Lorrain Smith.*) These are dry bulb readings?—These are dry bulb readings. The wet bulb would be probably less than two degrees lower in the early morning.

1687. (*Professor Petavel.*) So most of the day you were below 70°, I gather?—Well, I think not, because the temperature would rise rapidly. We would probably keep the heating pipes to raise it.

1688. Were these taken first thing in the morning?—At six o'clock.

1689. When the work was starting?—Before work started.

(*Chairman.*) Six o'clock is not a very satisfactory time to take readings.

1690. (*Professor Petavel.*) These are only experimental readings?—These are readings taken for me, so that I may see that the shop has been started warm.

1691. These are not the readings taken in the ordinary way?—No, certainly not.

1692. (*Chairman.*) How do you get the shed so warm at six o'clock in the morning?—By keeping the heating pipes on at night.

1693. The heating pipes. Then have you heating pipes in addition to the pipes that are used for conveying the steam?—Yes.

1694. You have two sets of pipes?—We have heating pipes right through the factory for heating purposes only, apart from humidity.

1695. Those pipes, I take it, are not covered?—They are not covered.

1696. You use them for heating?—Only for heating.

1697. (*Professor Lorrain Smith.*) Then the temperature of your shed rose roughly about ten degrees between six in the morning and six at night?—Fully ten degrees, from memory. In fact, I think it rises pretty rapidly and in winter remains about stationary when it gets up above 70°. I will see if I can tell you that. By ten o'clock it was 66° on the first day and 69° on the second. Do you want the readings?

1698. Well, it is interesting to know when you get to 70°, which you say is the minimum?—Well, I notice we are not at 70° every day in the winter until the afternoon. I mean we have not necessarily gone to 70°, but I know now from my experiments that my weavers were right in telling me I should have gone to 70°. I must confess that I was rather disinclined to steam up to 70° in the winter owing to the enormous amount of coal consumed, but from my experiments lately I now have to confess willingly that my weavers were wonderfully accurate in what they told me.

1699. What did they ask for?—They have generally asked for about 70°.

1700. (*Chairman.*) Up to what temperatures do you go in the hot summer days?—Take some of the hot days of last year. We might get some of the maximum temperatures that were reached. Shall I tell you the hottest temperature?

1701. We would like to take, say, one of the hottest weeks and see up to what temperature you went?—Would you like it in the form of so many days above 75°, or the hottest day we reached?

1702. Have you prepared a table?—I have a table of so many days above certain temperatures.

1703. Was that the hottest time of the year?—I have it for all the hot months of last year.

1704. That would be interesting, and we should like to see that.—I have May alone, I have June and July together, and then I have August and September each separately. I can give you them collectively, if you would like; or would you like them separately?

1705. It does not matter, just as you have them there. I will give them collectively.

1706. (*Professor Petavel.*) This is last year?—This is 1911.

1707. (*Chairman.*) Yes?—I take that because it was a hot summer.

1708. (*Professor Lorrain Smith.*) These are days above 75°?—Yes.

1709. (*Professor Petavel.*) Have you also days above 80°? It is classified that way?—Yes.

1710. It would be interesting to have that also. It is only fair to say that our factory is situated in an exceptional place for keeping cool in summer, as it is not surrounded by houses. There are no houses round, so that it has the cooling effect of the breezes from the fields instead of being surrounded by heated air caused by the sun's rays being concentrated on the roofs of surrounding houses, as in a city.

1711. Are there any features about the capacity of your factory—the size of it?—Yes, it is large in capacity per person employed.

1712. Large compared with other factories?—Yes.

1713. And that would tend to make it cooler?—Yes, I should say so.

1714. Above 75° in the forenoon during the whole summer we had 21 days; in the afternoon we had 65 days.

1714*a*. (*Chairman.*) How much above 75°?—I could not say without taking it out, but above 80° we have 13 days in the afternoon.

1715. (*Professor Petavel.*) None in the morning?—None in the morning.

1716. That is 80° wet bulb?—Wet bulb reading.

1717. (*Professor Lorrain Smith.*) That is May to the end of August?—1st of May to the end of September. Of course if we took the whole year we would have considerably more. I think I read out a number of days which were above 75° in December.

1718. (*Professor Petavel.*) Were you using any special means to cool the shed that year?—Last summer we were using means to ventilate. I think I would call it agitating the air.

1719. (*Chairman.*) In what way?—We withdraw the air from the shed and put it back again. We pass it through a cold spray and put it back again into the shed, the effect, so far as I could see, being to keep the air moving in the shed.

1720. Did it reduce the temperature?—I cannot answer that definitely.

1721. You have been up to 80°, have you?—Yes.

1722. Are you going to give us any more figures?—No, I do not know of any other figures that I have which would be of interest to you.

1723. On these days when it went up to 80° had you any reason to suppose your weavers were suffering from the heat?—No. Anything I have heard from our weavers last year was to the effect that the shop was not hot. That is the general way of expressing it.

1724. (*Professor Lorrain Smith.*) That is compared with others?—Well, I do not know. I could not answer that; but of course what they meant was it was not very oppressive; and the reason that I gave in my own mind for it was movement of air, because I do not think the readings of the thermometers were much lower on account of the movement of the air.

1725. (*Professor Petavel.*) Could you give us any idea of the power of the fans or the speed of the air or the amount of air transferred?—One 48-inch fan running at about 500 revolutions, 48-inch low-pressure fan. I think that is about 28,000 cubic feet a minute, but I cannot tell you from tests. That is only from books.

1726. (*Professor Lorrain Smith.*) They felt the benefit of the moving air in the shed?—I think very decidedly; but I must say I think some weavers did not approve of it, because they thought that the movement of the air kept the yarn from weaving so well.

1727. (*Professor Petavel.*) Even on the hot days there was an objection to it?—Even on the hot days. My own impression is that it does not affect the yarn much when it is brought through the cold water and comes in really at saturation; but it is only fair to say that one weaver in particular has most consistently told me that he can tell by his cloth when it is put on. He is a fine weaver and a man whose word I respect.

1728–1737.—*Confidential.*

1738. What do you consider is the least difference between the wet and dry bulb thermometers for efficient weaving in your regular branch of the trade?—In what way sir?

1739. Well, I mean probably you do not want saturation?—No, I do not think we want saturation.

1740. Can you weave efficiently with a difference of two degrees as at present laid down?—We can at high temperatures, but our weavers would like a difference of only one degree on many occasions if they could get it.

1741. Have you found any difficulty in the very hottest days of getting a difference of two degrees?—Of keeping down to two degrees, do you mean?

1742. Yes?—On the very hot days we generally rise a little above two degrees when we get up to the high temperatures. It is two and a half to three degrees when we get up near 80°, although our weavers would very much prefer that we did not. I have often been asked for more humidity at these high temperatures when our plant would not give it.

1743. The reason you did not give it was your plant would not give it?—Our plant would not give it on some very dry days, and we have been gradually enlarging our plant to improve matters in that way.

1744–1764.—*Confidential.*

1765. (*Mr. Ewart.*) I conclude the whole humidifying apparatus is not large enough to give you a difference of two degrees when the dry bulb is 80° to 85°?—Well, it is, I believe, at present.

1766. Since you altered it?—Yes.

1767. Added to it?—Yes; but as we can see by the record we have never been really far from two degrees.

1768. The reason I mentioned that the experiment would be interesting getting up close to saturation and at a higher temperature is that evidence has been given here that above a certain temperature the weaving becomes bad?—I have never heard that.

1769. That was given by several witnesses?—The only way that I can imagine it becoming bad is for want of humidity; and of course I know that many plants will not give the necessary humidity when the temperature rises high.

1770–1772.—*Confidential.*

1773. (*Professor Petavel.*) We were told that owing to carelessness or other causes the temperature in certain sheds was increased to such an extent that the warps stuck to the back shell?—On that point I have been speaking to several of our weavers, partly that I wanted the information for myself; and they tell me that they do not remember it having happened in our sheds of recent years.

1774. (*Mr. Ewart.*) But then yours is a cool shed?—But I have never heard of it happening at high temperatures. It is at cool temperatures that I have heard of it.

1775. (*Professor Petavel.*) I think at any temperature if they got excessive humidity?—Well, I have never heard of such an excess of humidity at high temperature which could make that happen, but I know that it could happen with saturation at low temperatures or with saturation at high temperatures; but one could not imagine getting saturation at the like of 80°. I think it is out of the bounds of possibility, almost, is it not?

1776–1784.—*Confidential.*

1785. (*Professor Lorrain Smith.*) Have you made a study of the bad days and the good days?—I am sorry I have not. That is a question about which I cannot answer definitely, though I know that my weavers are very strong on the point.

1786. Are the good days not defined by the hygrometer?—I have very clearly impressed on my own mind that it is not; but I must say that it is not from experiment. It is from my weavers' opinions, and you see my experiments have verified their opinions so very exactly that I have very great confidence in their opinions.

1787. Would you mind making notes on good or bad days especially?—I have been trying to do so for the last few weeks, but we have not had any really bad days during the latter part of this summer.

1788. Especially a good or bad day which is not indicated by the thermometers?—Well, of course it is indicated outside by the thermometer; I have no doubt of that. A bad day will be indicated outside.

1789. (*Professor Petavel.*) You would not agree, then, with what has been suggested: that you might get a day with a good deal of moisture outside, and yet a bad day? You think it is intimately connected with the amount of moisture outside?—I think so. I could scarcely imagine anything else, but with a strong wind outside the weave may be poor in spite of the outside damp.

1790. (*Professor Lorrain Smith.*) What has been put to us is that with the thermometers reading more or less identically on two days outside and inside, the conditions being the same practically as far as the thermometers are concerned, one is a good day and one is a bad day?—I have always thought it was the effect of static electricity that made the difference. I could understand that the thermometers could be the same on two different days, and one day have a strong wind and the other not.

The witness withdrew.

Mr. THOMAS H. SPENCE called and examined.

1791. (*Chairman.*) What is your firm?—Spence, Bryson & Company, Ltd.

1792. Are you one of the principals of the firm?—Yes.

1793. What do you manufacture?—Almost exclusively linen cambrics. I suppose under that head you would include sheer cambric.

1794. How many sheds have you?—We have the Portadown place and the Market Hill place—four sheds altogether.

1795. Are they about the same size?—No, we have about 301 looms in one shed and 300 in another, roughly speaking, and 70 something in another shed, and 140 in another—816 looms altogether I think it is.

1796. In proportion to the number of looms and the number of workers is the cubic capacity about the same in each shed?—The same in all the sheds.

1797. The relative cubic capacity?—Yes, in all the sheds.

1798. What methods of humidifying have you in the sheds?—In the Portadown factory we discharge water from a condenser—that is an engine condenser—into a chamber where it is broken into a spray. There is an inlet into the humidifying chamber admitting fresh air, which is drawn through the spray and so humidified, after which it is discharged through tubes in the shed.

1799. A trunk running, I suppose, the whole length of the place?—Yes.

1800. Is that what is known as Nield's system?—That is the Nield system, yes.

1801. Have you adopted the Nield system pure and simple?—It is the Neild system in Portadown, and in Market Hill we have steam jets, but we do not approve of that system and intend replacing it by something more modern

1802. Under which system do you think it is more comfortable for the workers?—I think Neild's, because there is a quantity of fresh air we are taking in. The air is changed so often

1803. Do you get the whole of your humidity from this Nield's system?—Yes, we get seven-eighths of it from the Nield system. If the humidity is not sufficient we have steam pipes into it through which we can blow off steam, but we rarely want it

1804. Is the shed ventilated any other way?—By fans, especially in the damp places.

1805. How many fans?—I could not answer at the moment There will be a young man from our place and he will give you this technical information. He is better acquainted with it than I am.

1806. Do you ventilate on the exhaust or plenum system? Do you pump air in or suck it out?—The Portadown place is ventilated on Neild's system, which is Plenum, but we have also exhaust fans in damp places.

1807. Where are the fans?—Mostly round the damp cold walls

1808. In the roof?—In the roof, yes.

1809. At the end of the roof——

1810. (*Professor Petavel.*) Is there any space between the glass and the gutter?—Three-quarters or seven-eighths left for ventilation at the top between the slates and the glass somewhere.

1811. Near the gutters, probably?—Yes, we have ventilation up there.

1812. (*Chairman.*) Not at the apex?—No.

1813. Does not the water come in?—No, it is overlapped, but the air can get out.

1814. From what source do you get your humidity?—From the water from the condenser, broken up.

1815. You manufacture fine cambrics?—Very fine cambrics. I will just show you if you have any desire to see what we are manufacturing at the present time. That is our coarsest to our finest (*handing in samples*).

1816. How would you describe this?—That is a ten hundred. This is a twenty-five hundred.

1817. (*Mr. Ewart.*) Is that power loom or hand loom?—Power, 160's warp and 220's weft.

1818. (*Professor Petavel.*) That is about as fine as it is commercially spun?—Yes.

1819. (*Chairman.*) What is the maximum difference between the wet and dry bulb thermometers that you consider necessary for satisfactory weaving?—Well, we consider two degrees ample. Sometimes, of course, when it is an easterly wind or a north-easterly wind, we would let them have more humidity, but I would like to have less, as in that case our cloth is usually a quarter of an inch too wide, and yarns more difficult to weave.

1820. Have you ever tried any actual experiments?—No.

1821. To see whether you could weave satisfactorily, say, with a difference of two and a half or three?—We could not do it.

1822. Have you ever tried?—No, but these conditions have sometimes occurred without trying, with the consequence that the weavers complained.

1823. What temperature do you consider necessary for good weaving?—Most of our weavers like somewhere between 68° and 70°, or 71°. Of course, a great deal depends on the day. For instance, if it was a humid day they would be content with 69° or 68°; if it is a dry day, 70° or 71°.

1824. At a temperature of 70° you have no difficulty in getting the relative humidity?—No, 70° on the dry bulb and 68° on the wet is all right.

1825. Can you get your relative humidity at 75°?—We have to watch that. If we find the difference is getting too great we have a steam pipe leading into our duct, and we have to let off steam to keep the readings right.

1826. What are the highest temperatures to which you go?—I think somewhere about 80° this year. I think about 85° last year.

1827. (*Professor Petavel.*) Do you remember whether it is on the wet bulb or dry bulb?—That is the dry bulb I am speaking of now.

1828 (*Chairman.*) Were those warm days?—I could not give you the readings. Mr. Lutton will give them to you.

1829. On those warm days were there any complaints from workers at all?—No complaints.

1830. Do you think they would complain if they felt that the heat was injuring their health?—Yes, I daresay they would, but we have had no complaints whatever. They are intelligent enough to know they could not weave fine yarns unless they had the humidity.

1831. Of course, as we have heard, you can weave fine yarns very much below 80°. You can weave fine yarns down at 70°?—Yes.

1832. But when it gets higher your difficulty is you cannot get enough moisture?—In order to weave we must have the relative moisture, even if it does get high.

1833. And you have a great difficulty in getting it, I take it?—We have great difficulty in getting it.

1834. The weavers appear to have had a meeting in your neighbourhood, I think?—Yes, a meeting last night. I was not at it

1835–6. There was something reported in the Press to-day. Do you know who proposed this meeting?—A notice was put up in the factory.

1837. The employers put it up?—The employers, yes.

1838. I see they passed a resolution which we have before us. I suppose it will be sent to us?—I did not wish to interfere in the thing at all because I wanted to leave it entirely to their own option.

1839. There is one thing I notice here. They believe that 70° would be suitable for weaving, and comfortable as well?—Yes, they do not like it too cold.

1840. Do they like it too hot?—Certainly, when it goes above 75° or 80° it is not comfortable; but, besides being a matter of comfort and the ability to earn money, it is a matter of having to work twice as hard one time than another time.

1841. But they seem to fix 70° as a limit at which they can work with any comfort?—No, they did not say that. They said they would even be quite content and comfortable at 80°.

1842. They believe 70° to be suitable and comfortable as well. They do not say so, but it implies that anything above that is not suitable and is not comfortable?—I would not gather that at all. That is the notice that was put up in the factory (*handed in*).

1843. Supposing after careful medical inquiry and taking body temperatures and so on, it was shown that above 75° the workers suffered in health?—I do not think so.

1844. But I mean to say supposing it should be shown hereafter?—Well that is a question for the people who are able to speak on the subject, but I think when the workers make no complaint——

1845. I did not finish my question. You answered before I finished. What I was going to say is this: supposing that hereafter it is found by medical experts that if people work in a temperature with the wet bulb above 75°, that their health suffers, would that be a question for serious consideration, as well as getting the most efficient weaving?—Certainly it would; but the only thing I can see is if you make any change when we are weaving these fine goods we shall have to shut off in the summer-time We could not possibly weave.

1846. (*Mr. Ewart.*) You could weave, but you could not make a profit?—We should not attempt to weave 24 hundred and 25 hundred cambrics at all. They would not be able to weave. It is a matter of comfort or stopping work,

1847. (*Chairman.*) Coming to that question of stopping work, do you think (always assuming that it is shown hereafter that the health would be injured) that any system could be devised whereby the work could be stopped when the temperature gets up to a certain height with some arrangement for making up lost time, as used to be the case in the old water-mills when there was a draught or too much water?—Well, of course that is a problematical question. I do not know, but at the same time, if the Government wishes to subsidise the workers all right——

1848. There is no question of subsidising the workers at all. The question is supposing the worker suffers?—But have we any evidence of the workers suffering?

1849. But supposing medical evidence shows that they do. I may not have an opportunity of asking you after we have the medical evidence?—I mean to say if you wish to pass a law that we get no humidity after 75°, then I say we cannot work. We could not work absolutely. I am quite sure we could not work fine cambrics. You might work that coarsest material, but you could not weave fine cambrics. There is no man can do it.

1850. It may be found that is the case, of course. We must be guided by the evidence we hear, and this question will not be settled without careful consideration?—I am quite sure about that; it is utterly impossible to weave fine cambrics.

1851. Have you actually made experiments to see if it would be possible?—The only experiment is that when the difference between the bulbs becomes more than two degrees, the weavers ask for more humidity. When we come to three degrees difference there is a general outcry. If that difference were maintained (though we never allow that), looms weaving 22^{s} and finer would have to be stopped, whilst breakages in the other looms would so increase that only a small number would be found going at any one time. I have no doubt but that if a difference of three degrees were maintained there would be a strike.

1852. You have told us that on some occasions the heat was so great that you had to stop working?—No, I did not say that.

1853. (*Mr Ewart.*) No. I understand if this thing became law he would have to stop work?—If you make a bigger difference between the dry and wet bulbs than at present we should have to stop work. That is, if you make it three or four degrees.

1854. (*Chairman.*) That would not be on account of the heat, but would be on account of the inefficient weaving?—Yes.

1855. Then I misunderstood. I thought you said on some occasions you had had to stop work on account of the heat?—No.

1856. (*Mr. Ewart.*) I would like to ask about that point that was put before us by practical weavers. They told us that there is a proper temperature to weave and a proper humidity, and if there is a change downwards or upwards it is equally bad for the weaving?—There is a temperature at which good weaving is obtained and which is found perfectly comfortable as well. At a higher temperature the weaving might improve, but it would not be so comfortable. If it is too damp it is bad for weaving too, because the yarn would get too much moisture and a slow weaver would be retarded.

1857. How would he be retarded?—Too much damp, and consequently the warps would stick in the hedles and the back shell in the fine cambrics.

1858. This was told us in reference to high summer temperatures, and I should like to know from your actual experience when the temperature goes up, as it did last year, to 85°, have you been able to keep the wet bulb at 83°?—Well, it is very difficult. I understand it is very difficult. I think it would be oftener 82° to 83°, but I think if you ask our under-manager he will give you those technical points better than I can. He is to give evidence here, and he is in possession of all these points.

1859. Evidence having been given, we want to get that corroborated or put on one side?—Yes.

The witness withdrew.

FIFTH DAY.

Wednesday, 18th September 1912.

At Belfast.

PRESENT:

COMMANDER SIR HAMILTON FREER-SMITH, R.N., C.S.I. (*Chairman*).

Mr. HENRY CUMMINS.
Mr. HERBERT EWART.
Professor J. E. PETAVEL, F.R.S.
Professor LORRAIN SMITH, F.R.S.
Mr. D. R. WILSON (*Secretary*).

Mr. GEORGE ELLIOTT LUTTON called and examined.

1860. (*Chairman.*) What position do you occupy?—Assistant manager.

1861. In what works?—Spence, Bryson & Company, Limited, Portadown.

1862. Weaving manager?—Yes.

1863. We have heard already about the number of sheds you have and the number of looms. I think we have also heard about your method of ventilation. How long have you had practical knowledge in relation to weaving?—Ten years.

1864. Has that been confined to fine cambrics or have you knowledge of other classes of goods?—That has been confined to fine cambrics.

1865. And you manufacture fine cambrics in the works in which you are now employed?—Yes. Of course, we also manufacture some fine boiled yarns and also sheer linens, but I suppose they come under the same head as fine cambrics.

1866. (*Professor Petavel.*) Do they all require the same conditions? They are all in the same shed, I presume?—Yes, they are all in the same shed.

1867. (*Chairman.*) Have you formed any opinion as to whether artificial humidity is necessary for weaving in your branch of the trade?—It certainly is

1868. To what extent do you consider it necessary?—I consider the present regulation of two degrees difference between the wet and dry bulbs as giving at certain temperatures the highest efficiency.

1869. At certain temperatures?—Yes.

1870. Can you tell us at what temperatures?—I consider about 70° on the dry bulb—70°, or about

1871 What happens when the dry bulb gets up higher?—Of course, when the dry bulb gets higher there is more difficulty in keeping the proper degree of artificial humidity; the difference between the wet and dry bulbs is likely to increase

1872. As the temperature gets higher?—As the temperature gets higher.

1873. Can you provide for that by introducing more artificial humidity?—Yes, I should say that in our case that is only a mechanical difficulty.

1874 Then, as a matter of fact, do you get over that difficulty by introducing more humidity?—Yes, we do.

1875 You get over it ——

1876. (*Mr. Ewart.*) Completely?—Well, not completely. As I said before, it is more difficult. It takes more careful watching, and, of course, slips occur.

1877. (*Chairman.*) Up to what temperature can you succeed?—I should say I cannot draw a fine line there. I cannot say from recollection.

(*Mr. Ewart.*) Would there be any objection to asking questions on this point now?

(*Chairman.*) Not at all.

1878. (*Mr. Ewart.*) Would the difficulty be greater on certain days although the temperature might be about the same?—Do you mean the difficulty of maintaining a certain degree of humidity, or the difficulty of maintaining an efficient weave?

Well, we are talking entirely about humidity

(*Chairman.*) The one seems to follow the other.

(*Professor Lorrain Smith.*) Not altogether

1879. (*Mr. Ewart.*) I was wanting to get an answer from you as to whether you found a difficulty irrespective of the temperature in obtaining a good weave. That is the question of bad weaving days and good weaving days?—Irrespective of humidity, yes. We do find it more difficult on certain days to maintain a good weave irrespective of humidity.

1880. (*Professor Lorrain Smith*) That is to say although the humidity is up to the two degrees of difference?—Yes.

1881. The weaving is still bad?—Perhaps I had better qualify my statement.

1882. Yes, in your own words?—Suppose on each of two days we had, say, 68° on the dry bulb and 66° on the wet, there might be better weaving on one of those days than on the other.

1883. (*Professor Petavel.*) To what cause do you attribute the difference?—The cause that I attribute it to is static electricity.

1884. (*Chairman.*) I suppose you mean you are weaving the same class of yarn on both days?—The same class.

1885. (*Professor Lorrain Smith*) I am not quite clear what you mean by the difficulty when you get over 70° Is it solely the question of keeping up the humidity?—No, I think that is the temperature most agreeable to the weavers.

1886. From all causes?—From all causes. I think we have in or about that. Of course I am not drawing a hard and fast line there

1887. But, say, 75° or 80°? You would prefer to have 70° if you could manage it?—Yes.

1888. Although you are able to keep the humidity up to two degrees of difference?—I must decline to answer that definitely, as I do not feel quite competent to do so All I say is, the weaver is perfectly satisfied with the conditions when the dry bulb is at 70° to 72°, with the wet bulb two degrees lower, and a humid atmosphere outside the factory.

1889 (*Chairman*) Now, up to what temperature on the wet bulb do you go on the hottest days?—Well, Sir Hamilton, if I may consult the records——

1890. Certainly?—1911 was, of course, abnormally warm, therefore I think the highest temperatures in that year would be very good for your purpose.

1891. Yes?—85½°.

1892. (*Professor Petavel.*) Wet or dry bulb?—That is wet.

1893. (*Chairman.*) On what day was that?—That was on the 16th August.

1894. That is the wet bulb?—Wet bulb.

1895. What had you on the dry bulb?—87½°.

1896. What relative humidity would that give you?—Well, as to the relative humidity I could not say without a table.

1897. There was considerable humidity then, as indicated by the difference between the bulbs there?—That is so

1898. Yes. Then you managed even with the wet bulb at 85° to humidify sufficiently to get within two degrees?—Yes.

1899 That being the highest you reached we may take it you can always keep up within two degrees?—We can do it by careful watching.

1900. What sort of a weave did you get on that day?—I have not got any record.

1901. Take similar days—days, perhaps, where the temperature is about the same—what sort of a weave do you get on those days?—I am afraid I have not any records showing the weave on particular days.

1902. (*Professor Petavel*) But what is your impression as to the nature of the weaving at very high temperatures?—I have never had any complaints of the weaving efficiency, or the want of efficiency as a result of heat.

1903. (*Chairman.*) Have you ever heard anybody say, or can you say for yourself, that the weaving sometimes suffers from too much humidity?—Never, when the present schedule is not exceeded, but in a new shed we have had cases where weavers in a cold corner, where there was saturation and perhaps condensation, did complain. We did have complaints, but to counteract that we put in exhaust fans to bring the humidity down to the regulation, but it should be borne in mind that we only had a complaint when the degree of humidity was much higher than is at present allowed

1904 What was the exact nature of the complaint?—The complaint was made because if the loom was left lying off, as they call it, the weaver got (to use another term in their words) "stuck up."

1905. But what does "stuck up" mean? We should like you to tell us?—Well, the yarn becomes very moist and refuses to pass over the back shell of the loom

1906. Why is it too moist?—Because in that corner the temperature was very considerably lower, with the result that probably saturation point was reached.

1907. In what shed was that?—That was in No. 3.

1908. How many looms are there in that corner?—I do not know exactly how many looms there are in the corner.

1909. (*Professor Lorrain Smith.*) How many looms are affected?—I should say about six.

1910. (*Chairman*) On these days when the temperature is very high have you personally felt any discomfort in the shed or any feeling of exhaustion after the day's work?—Well, of course, Sir Hamilton, my case is not typical, because I do not spend the day in the shed.

1911. I will at present ask you simply your own experience?—Well, I never have felt exhausted.

1912. But I think you were going to say your case was not the same as the weavers. I mean probably you were not in the shed the whole time whereas the weavers are during the whole of the working hours?—Yes, but I do not want it to be taken that I am saying that though I was not exhausted the weavers were.

1913. You have not said so. We are not going to take anything you have not said. I ask you just now about your own feelings, and you went on to say something to the effect that your case was not like the case of the weavers. Will you explain now to us why your case is not the same as the weavers?—As I have already said, because I do not spend the entire day in the weaving shed.

1914. That very well accounts for it. Now are you able to tell us from anything that has been said to you or from personal observation whether on these hot days the weavers suffer from any bodily exhaustion or discomfort at their work?—I should say that on a very warm day they would certainly prefer it cooler.

1915. But why would they prefer it cooler?—Well, it is a question of comfort.

1916. You think they would be more comfortable if it was cooler. Is that what you mean?—It is.

1917. Do not let me put words into your mouth. I want to understand exactly what you mean?—I say they would be more comfortable at 80° than they would at 85°.

1918. Have any complaints ever reached you, or reached the firm through under-managers, as to the heat in the sheds?—No actual complaints, but weavers have occasionally expressed a desire to work in one shed in preference to another on the hottest summer days.

1919. Why?—Because one shed was cooler than the other. Of couse it must also be said that in the winter they prefer the warmer shed.

1920. Now do you think that in the event of the weavers suffering from excessive heat they would have any reluctance in making any complaint to the firm or to the management?—In our case I am sure they would not. All their complaints are heard.

1921. I think there was a meeting held of your weavers the other night?—That is so.

1922. At whose suggestion was that meeting held?—That was held at their own suggestion

1923. Who made the first suggestion?—For the meeting?

1924. For a meeting?—I do not know what you would call a suggestion. I will relate what actually took place

1925. Yes, do please?—We put up a notice informing our weavers that we had been asked to give evidence before this Committee.

1926. Evidence in regard to what?—In regard to humidity, and we expressed a desire to know the wishes of our workers, and we asked that a number who had opinions to give would let us have the benefit of them.

1927. Were the people who gave these opinions selected weavers?—Certainly not. It was absolutely free to any person to come. .

1928. Any person could come who wished to give an opinion?—That is so. They expressed the opinion that a reduction of humidity would be detrimental to their interests. We asked them, if we protested would we have their support, and they assured us that we would. After that interview, some of the weavers spoke to one of our tenters about getting up some form of protest, and the result was the meeting of which you have read. I wish it to be clearly understood that while we gave every facility to the holding of that meeting, we exerted absolutely no pressure. The only condition we made was that every facility would be given for an expression of opinion differing from that of the majority, and that was most loyally and thoroughly carried out, but no such expression was forthcoming.

1929. Is it within your knowledge that a resolution was passed?—Yes.

1930. And I think the resolution said that they would not like to see any reduction on the present legalised amount of humidity?—Yes.

1931. Was there anything said in regard to temperature?—Yes

1932. What was said?—Several spoke about temperature. They said that a fairly high temperature was necessary; that they desired a fairly high temperature. One man, a tenter, said—he volunteered this information—that he had made observations (he mentioned the number of years) and he found that they got the best weaving at the temperature of 70°, and it is largely from that, and what our workers tell me, that I am influenced to-day to tell you 70°, together with my own observations.

1933. That is wet bulb?—Dry bulb.

1934. (*Professor Lorrain Smith.*) What exactly was meant by making observations?—I do not mean making records, but I mean, as I have observed in my going in and out amongst the weavers.

1935. Was it more than a general impression? Was there anything more definite than a general impression when he said he had made observation?—I am sure there was in his case.

1936. What would he observe?—I understood that he had observed the thermometer. This is a report prepared by a reporter, and not biassed in any way. That is the strip from the type set up for the local newspaper. As a former witness mentioned that he had spoken of this, I obtained that to show you.

1937. (*Chairman.*) From what paper is this?—The "Portadown Express."

1938. This is evidently a very much fuller report of the meeting than anything we have seen up to the present. This is public property, I take it?—It will be public property on Friday. The paper is published on Friday. That is the type set up for the paper I did not have it specially printed I did not know they had the type set up until I saw the strip.

1939. Then probably you would like to keep this?—No, it will not be necessary. I will be able to obtain as many copies of the newspaper as I want.

1940. Can I have this?—By all means. There were two reporters there. The "Portadown News" has also got a lengthy report, I believe.

1941. (*Mr Ewart.*) Have you read the regulations issued with regard to cotton cloth factories, which came into force, I think, on the 1st of April last?—I have

1942. As I understand them, when the wet bulb reads 75° all additional artificial humidity must cease Is that so?—I believe so. That is what I take it to be.

1943. Have you considered how a similar condition would affect your industry?—I have.

1944. Will you tell us what your opinion is?—My opinion is that as the difference between the two bulbs increased weaving efficiency would decrease.

1945. Weaving efficiency; that means that the labour would increase, the actual work for the weaver to do would increase?—It would.

1946. (*Professor Petavel.*) Have you tried any actual experiments to show what increase of labour or what loss in manufacture would be the result of two or three or four degrees difference?—I have not made any experiment for the purpose of giving evidence before this Committee, but I am authorised by my directors to make this offer, that we will make an experiment under your supervision or any person whom you may appoint, if that would be of any assistance to this Committee.

1947. (*Chairman.*) I think it certainly would be, and we propose bye-and-bye to consider the best methods of making such experiments and to communicate with the Manufacturers' Association. There will be plenty of time before the Committee reports. It may be done deliberately and at best times It may not be confined to one factory, but we shall be glad to see experiments made, and I think it desirable inasmuch as we have conflicting evidence?—I had not quite finished. Perhaps I may add that a few years ago while we were extending we temporarily used a room in which we had not the usual means of humidifying. We used steam jets, but we did not get to within the two degrees We tried to improve the conditions by using additional softeners and deliquescents in the dressing, but notwithstanding that we could not get the yarn to weave, we could not keep weavers in that room.

1948. (*Professor Petavel.*) Do you remember what the difference you obtained between the wet and dry bulb in that experimental room was?—I am sorry, I do not.

1949. You spoke of deliquescents in the dressing The yarn, if dressed in that way, can be woven with less moisture, I conclude, is that correct?—I do not think so. I do not believe it is moisture in the yarn that makes good weaving

1950. Why did you use the deliquescents then?—We used it, of course, in the dressing, but what I mean to say is I do not believe moisture is produced with the object of getting the yarn saturated or to absorb moisture.

1951. No, but to come back to the question, you used deliquescents in a shed in which you could not obtain (because it was a temporary shed) the full degree of moisture. I conclude—and I should like to know whether that conclusion is also yours—that the deliquescents apparently enabled you to weave more easily with less moisture?—We hoped it would, but it did not.

1952. There was no effect?—No effect.

1953. (*Mr. Ewart.*) In fine goods, is the use of deliquescents general?—I do not believe so. We do not use it, and I do not know anyone who does. We did try it once since the occasion we mentioned, but it was a failure.

1954. (*Mr. Cummins.*) When the wet bulb goes to a certain height—say when the yarn is saturated—is not it really as bad weaving as when it is dry?—I do not see under what circumstances the yarn could be saturated if the looms were kept going.

1955. That is when there is too much damp?—We could not have too much damp unless we had very considerably more than we are at present allowed.

(*Professor Petavel.*) Well, we had evidence some days ago when the statement was made that the weaver had to stop—I think that was the way it was put—or the loom had to be stopped because the moisture was excessive and that French chalk was used to overcome this. That, I took it, implied it was during the weaving. It is admitted that when the loom is stopped excessive moisture may be damaging, but is not it during weaving?——

(*Mr. Ewart.*) I think the statement was that if while attending to breaks in one loom the weaver had to stop the one behind him, by the time he got those breaks attended to the other one would not start because the yarn was sticking to the back shell.

1956. (*Professor Lorrain Smith.*) There was also a statement that the yarn became towy?—That is quite possible

1957. Is not that during weaving? Does not the yarn become towy during weaving and not when the loom is stopped?—I think what happens is the yarn becomes saturated with moisture while the loom is stopped and then becomes towy when weaving re-commences, but I can only believe that occurred when there was a higher degree of moisture than is at present allowed.

1958. Yes. It is a question whether excessive moisture makes the weaving bad or not?—Of course, if by excessive you mean that the two bulbs are less than two degrees apart.

1959. Then you would get a bad weave with less than two degrees difference?—You might weave quite efficiently up to saturation, but if you left a loom lying off while humidity was being produced up to dew point, and then re-commenced you would have some difficulty until what the weavers call a lap of the beam was woven off, after that the yarn would go quite well, if kept going.

1960. When the yarn has stood a little in a saturated atmosphere it is difficult to weave?—Yes, I should say so, if the yarn itself has become saturated.

The witness withdrew.

MR. JAMES GLASGOW CRAWFORD called and examined.

1961. (*Chairman.*) What position do you hold?—Managing director of the York Street Flax Spinning Company, Limited.

1962. It goes without saying that you have had a considerable experience in regard to flax spinning?—Yes

1963. May we ask how many years' experience?—Twenty-three.

1964. Was all your experience gained in York Street?—Yes.

1965. (*Professor Petavel.*) Might we have down the number of spindles?—In the two mills there are about 60,000 spindles.

1966. (*Chairman.*) Will you tell us what class of yarn you spin?—We spin all classes of yarn, not the very coarsest, but heavy yarns from about 10 leas to 250—280 occasionally.

1967. Are there different counts of yarn spun in different rooms? Are they classified, or do you spin yarns of all counts in the different rooms?—They are classified in a rough way; they are not absolutely classified.

1968. Could you just give us some idea as to the different kinds that are spun in the different rooms?—Generally speaking the tows are kept almost entirely in one room by themselves, or as many rooms as are required to spin the tows, and all the fine goods are kept together in a general way, but then there are other numbers spun in the rooms. There is no exact classification.

1969. Speaking generally, could you tell us what you consider a desirable temperature for spinning, or desirable temperatures if different temperatures are required for different classes?—The temperature is mainly dependent on the temperature of the trough.

1970. But apart from that what do you consider as necessary?—We have never considered the question of temperature apart from just the resultant temperature owing to the trough temperature. We do not have to heat a spinning room at any time. All our efforts have been towards reducing the temperature.

1971. Now the floors are necessarily, I take it, wet?—Yes, more or less.

1972. And on some frames you have splash-guards?—Yes, those that are required by law to have them.

1973. Those are ones of a certain pitch?—Yes.

1974. What pitch, can you remember?—I think it is 2¼ inch.

1975. And on the others you have no splash guards?—Yes.

1976. How are the workers protected from the moisture that is given off by the spray from the fliers?—By waterproof aprons.

1977. Is the chest in any way protected?—The waterproof aprons are made with bibs to them, but they invariably turn the bibs down. In the fine frames they do not wear waterproof aprons. A fine spinner does not wear a waterproof apron at all, she objects to it.

1978. Why is that?—The spray is so very light it does not penetrate an apron made of coarse canvas.

1979. Have you ever tried splash guards on frames other than the ones where they are now on?—No.

1980. You have never tried them?—No; our mill is so narrow. It is an old mill. It is so narrow that in order to be able to put on splashboards we have had to sandwich in the coarse frames with the fine frames so as to have splashboards on one side of the pass.

1981. You probably then cannot express any opinion, formed by actual trial, as to the use or otherwise of splashguards for protecting the workers?—No.

1982. Or as to the convenience or inconvenience for the workers in using them?—Well, they prefer not to have the splashboards even on the frames where they are.

1983. Why is that?—They say they are in their way.

1984. Now, I think that under the regulations framed for flax spinning and weaving factories, there is a clause which gives an exemption from making returns where the wet and dry bulb readings never get closer than within four degrees. Is that so?—Yes.

1985. Have you asked for that exemption?—We have asked for it in the case of all our spinning rooms.

1986. And have you obtained it?—Yes. I could not say there may not have been isolated instances accidentally, but it is maintained as a practical thing.

1987. A difference of four degrees is maintained?—Yes

1988. Is it easily maintained?—In our experience it is.

1989. And, as a matter of fact, would inconvenience be caused if, say, the difference was put at six or seven degrees?—We might not be able to guarantee to maintain it always at that, but on the average it would be six degrees, I should think. I would not guarantee to maintain it always at six degrees. I have not studied that point materially just to see what we could maintain it to. I think frequently it is about five degrees.

1990. Have you known it to go to eight?—I have known it to go to eight.

1991. And was the work satisfactorily carried on then?—We cannot detect any difference.

1992. With eight you did not detect any difference?—No.

1993. Would you say that for all classes of spinning?—In our experience it would not affect one more than the other.

1994. What are the sources of heat in these spinning rooms? From what sources do you expect the room to get heated?—Chiefly from the trough.

1995. And, as far as you know, have all reasonable precautions been taken to prevent that heating?—Well, the troughs are made of wood, and the lids are kept in good condition, so that they are very tight fitting. Beyond that I do not know of any precaution which could reasonably be taken.

1996. You cannot suggest any better method of preventing the heat radiating into the room from the troughs?—No, I have never considered it at all.

1997. Probably if you knew of some source you would adopt it?—Still, a thing to be workable in a spinning room has to be almost proof against any damage that could be inflicted upon it.

1998. Then the other sources of heat probably will be the friction?—There is friction from the machinery.

1999. And the steam pipes?—The steam pipes are covered, but there is always a certain amount of heat even from the covered steam pipe.

2000. But that to some extent might be met by putting on what experience has shown to be the very best non-conducting material?—As far as our knowledge went we put on what we considered to be the best.

2001. Supposing it were shown to you that there is something still better, would you think it desirable to put it on?—It would depend in what measure it was better, and what it was going to cost.

2002. These are the sources of heat in a spinning room?—Of course there is the light. When the room is lit there is a certain amount of heat generated.

2003. What is your system of lighting?—We have now got electric light, so there is a comparatively small amount of heat from that.

2004. And has the heat been appreciably reduced since you changed from what?—From gas. I have no figures for that, but just from experience of the rooms they are cooler.

2005. You would say from your feelings that the rooms are cooler?—Yes.

2006. Although you have no actual statistics to prove it?—No.

2007. We have heard of the sources of heat in the room. What are the methods of ventilation?—We have a certain number of fans along one side of the room. In one room, on the request of a factory inspector, we brought a pipe from the fan to a trunk down the middle of the room with openings in that trunk, but we could not detect, after careful watching, any improvement in that room over the others.

2008. Then generally speaking the system is to have fans on the walls?—In the top of the window.

2009. And what about window ventilation?—It is an order to our overlookers that the windows alongside the fans are not to be opened, and as far as possible no windows on that side of the room, but otherwise the windows are opened by the workers to suit themselves. They generally open them as much as they can.

2010. I take it it is desirable to avoid a draught in such rooms?—Yes.

2011. Have you taken any precautions to prevent direct draught on the workers or on the material?—No.

2012. Has there been any complaint of draught?—No; they shut the windows if they feel any draught.

2013. And when the windows are shut can you still maintain the difference between the thermometers?—Yes.

2014. (*Mr. Ewart.*) You speak of a difference between the wet and dry bulbs of six, seven, and eight degrees. Is that at all times of the year, or is it in the summer?—I really have not considered it from that point of view, but we have at no time any difficulty in keeping four. There are certainly some times of the year when it goes about five. I am nearly always passing through the spinning rooms and I look at it, but I cannot just say at what times of the year.

2015. (*Professor Lorrain Smith.*) But you say you have no difficulty in managing the shed so that you can have this exemption?—Yes.

2016. Would yesterday be a sort of average summer day?—No, yesterday was much drier than usual.

2017. As regards temperature?—There is much greater difference yesterday in the spinning room between the wet and dry bulbs than the average.

2018. (*Professor Petavel.*) I noticed yesterday in a fine spinning room there were ten degrees difference between the thermometers. Did that affect the spinning at all?—No.

2019. It is a matter of indifference you would conclude then?—Yes, I have never had any observation from the head spinner as to excessive difference.

2020. And at all counts?—Yes.

2021. And the temperature as such is also a matter of indifference, do you conclude?—Yes.

2022. Within reasonable limits, of course?—I have no experience of temperature down to or below 67°.

2023. (*Professor Lorrain Smith.*) You leave the workers to regulate the windows themselves?—Yes, largely; the overlooker controls it to a certain extent.

2024. (*Chairman.*) Is there anything you would like to say?—No, I really had not been intending to give any evidence here. It was only when you asked me yesterday if I would give evidence on those points that I came, but I had not been preparing any evidence.

2025. Now I will tell you the reason we went to see your spinning rooms yesterday and why we asked you to give evidence to-day is because these spinning rooms are representative of a class who have claimed exemption under the clause I referred to just now. Your spinning rooms were convenient for us to go and see, but we shall see others. That is the reason we chose yours, and having seen them we asked you if you would be good enough to give evidence to-day. I am very much obliged to you for coming?—Not at all.

The witness withdrew.

The following eight witnesses were operative weavers selected by the Secretary from a weaving shed, in which artificial humidity had been stopped for some hours with the object of ascertaining the effect of a lower relative humidity on the weaving of linen.

Mrs. M——— F——— called and examined.

2026. (*Chairman.*) Are you a weaver?—Yes.

2027. How long have you been a weaver?—About 30 years.

2028. And I suppose all the time you have worked in places where they have damp?—This is only the second place over I have been in.

2029. Did you have damp in both places?—Yes, in both places.

2030. On the very hot days in the summer do you suffer at all from the heat?—Well, a good deal.

2031 Is it worse when the damp is on or when it is not on?—We could not do without.

2032. But apart from that. I am not talking about the weaving but about your health. Does it make you feel tired or bad at all?—No, not so often.

2033. On the very hot days do you feel very exhausted after the day's work?—Sometimes.

2034. And I suppose worse than you do on the cool days?—Yes

2035. You said just now you could not do without the damp?—No, we could not do without it.

2036. But can you have too much?—No, I do not think so with the yarn.

2037 You do not think you can have too much?—I do not think so.

2038. You say you like the steam. Can you have too much?—No, I do not think we can have too much of it

2039 For the weaving?—I do not think so.

2040. Can you have too much for your health?—I do not think so. We have the best of health.

2041. Now about this afternoon. In the early part you had the steam. Just after the dinner hour you had the damp and then it was shut off; how did the weaving go?—Very badly.

2042. Did you have many breakages?—I had three or four rips I think, and plenty of yarn.

The witness withdrew.

Mrs E—— —— called and examined.

2043 (*Chairman.*) Are you a weaver?—Yes.

2044. How long have you been a weaver?—I have been a weaver since I was 14 years of age.

2045. What sort of health do you have?—Well, I have very good health. I could not complain.

2046. In the very hot days in the summer do you feel very tired after your work?—Well, just tired, after standing all day.

2047. Is it worse in the summer than in the winter?—Well, it is a little hotter, don't you know, but not so much.

2048. Does it make you feel more tired in the summer?—Yes.

2049. Do you think that working with the damp makes it worse for your health? I am not talking of the weaving now?—Well, I do not know about that. I could not complain about the damp.

2050. What sort of weaving have you had to-day?—Well, it was not so good as if the steam had been turned on. It was not so good in the afternoon as in the forenoon.

2051. Why was it bad in the afternoon?—Because there was no steam turned on.

2052. (*Mr. Wilson.*) Was it very bad?—It was not so very bad.

2053. (*Mr. Cummins.*) You would call it a fair weaving afternoon all through?—Yes, it might have been worse.

The witness withdrew.

R —— L —— called and examined.

2054. (*Chairman.*) Are you a weaver?—Yes.

2055. And how long have you been a weaver?—Well, a good lot of years, but it is 18 years since I come first in here.

2056. You have worked here 18 years?—Yes.

2057. What sort of health have you?—The very best.

2058. Do you ever have to go off sick?—No.

2059. On the very hot days in the summer do you suffer in health at all?—No, it does not seem to annoy me anything.

2060. The damp does not annoy you at all?—No, sir, it does not.

2061. Do you think the damp is good for weaving?—Yes, it is

2062. Can you have too much of it?—Well, we do not have too much in here.

2063. You do not have too much?—No, we do not have too much

2064. If you had too much what would you do?—Well, I do not know what I would do I suppose I would run away.

2065. Would you tell the spinning master or the overlooker?—Yes.

2066. The tenter?—Yes.

2067. Have you ever told him there is too much?—No, I have never had any cause.

2068. What sort of a weaving day has it been to-day?—Just middle this evening. We did not do well this evening at all.

2069. After what time did it do badly?—From 3 o'clock or so. Between 4 and 5 it has been working badly.

2070. It was worse between 4 and 5?—Well, I think it was, yes.

2071. Would you call it a fair weaving afternoon or a bad weaving afternoon?—It is a bad weaving afternoon I would call it on my part.

2072. Had you much piecing to do?—Yes, a good deal.

2073 (*Professor Petavel.*) You have had rather more work this afternoon?—Yes.

2074. On a very hot day would you rather have it like this or have the steam on?—I like the steam for the work. The yarn does not break out so much.

2075 Does it make you feel tired or exhausted?—No, I think nothing of it. It does not tire me or anything Our wefts does better in the steam.

The witness withdrew.

M—— A—— C—— called and examined.

2076. (*Chairman.*) How long have you been a weaver?—About 20 years

2077. In this mill?—Not altogether in this mill; about 13 years in this place.

2078. Where did you work before?—In ——.

2079. Did you weave the same yarn as here?—Yes.

2080. The same sort of work?—Just the same sort of work.

2081. What sort of health have you had?—Thank God, very good.

2082. All the time very good?—Very good.

2083. Have you ever had to go away and take a rest?—No, never.

2084. Ever had to go to the hospital?—No.

2085. Do you belong to a sick society?—Never.

2086 Do you belong to a sick society?—Yes.

2087. Have you ever had to draw any pay from it?—No.

2088. What sort of weave have you had to-day?—It was very good to-day.

2089. All day?—Yes.

2090. As good in the afternoon?—Very good, too.

2091. Very good this afternoon?—Yes.

2092. Did you have many breakages this afternoon?—Not very much.

2093. When did you have the most, this morning or this afternoon?—They were not so bad all day. Some days is better than others.

2094 (*Professor Lorrain Smith.*) This was a good day?—Yes. Some days they do not do so well—a stormy day or hot.

2095. A drier heat?—Yes.

2096. Do you mean in the summer?—Sometimes in the summer they do not do so well. The heat dries up the yarn

2097 But is it wet heat that does that?—Well, it takes extra steam in the summer-time.

2098. What kind were you weaving?—Fine work.

2099. Does that need the damp more than the coarse work?—Yes.

2100 (*Professor Petavel*) What is it—20's?—17.

2101. 17 square, is it?—Yes

2102. (*Mr. Cummins.*) That is 17 by 17?—Yes.

2103. (*Professor Lorrain Smith*) Have they always had steam here?—Yes.

2104. Did you ever work without steam?—No, never.

2105. Do any of the mills?—Only except where cotton is. It is impossible to work a fine weft without steam.

The witness withdrew.

M—— C—— called and examined

2106. (*Chairman.*) Are you a weaver?—Yes.

2107. How long have you been a weaver?—Since I left school, since I was about 14 or past

2108 Have you worked all the time in this mill?—Not in this mill; about five years here.

2109 Have you always worked in what they call the damp sheds?—Yes, in the weaving department always.

2110. What sort of health have you had?—The very best, perfect.

2111. Do you belong to a sick society?—Yes, I am in the Prudential I joined that for the State insurance.

2112. Have you had any sick pay at all?—No, not yet.

2113. Never been off sick?—No.

2114. How long have you belonged to this society?—Since the State insurance came in force.

2115. But before that did you belong to any society?—No, I never was in any trade union.

2116 Have you been off sick at all ever?—No, I never was off sick.

2117. What sort of comfort have you at your work?—Very good. I cannot complain about it—very clean and comfortable.

2118. Is the shed where you weave comfortable?—Yes, it is comfortable.

2119. Is it comfortable in summer and winter?—Yes.

2120 Which is the more comfortable—the summer?—Summer and winter it is very comfortable.

2121 Last summer was a very hot summer?—Well, it was not so hot; I have found it hotter.

2122. I do not mean this summer, last summer?—Yes, it was warm, but it was warm outside.

2123. Did it make you feel ill at all?—No, it never affects me, the heat.

2124. At the end of the day's work?—I never get out through heat. I can stand it greatly

2125 Do you like the damp?—I can put up with anything. I never find any difference with the damp. I never pay any attention; it has no effect on me.

2126. Has it an effect on the weaving?—Yes; in fact, in the winter time on a frosty day the yarn breaks very very badly.

2127. Without the damp?—Yes, the steaming We could not do work without it.

2128. Could you ever work without steam on any days at all?—No In the summer time the yarn gets dried up and the steam keeps it moistened and easier to work. That is the truth.

2129. What sort of weaving have you worked?—I am always on fine work, 19's.

2130. (*Professor Petavel*) But to-day you were on 16's?—Yes.

2131. (*Chairman.*) What sort of weaving have you had to day?—Even in the 16's I could not get it done. It broke out a great deal in the afternoon. It did not work very well in the afternoon, the steam was turned off, but on a frosty day we find it more so. On a frosty day we could not do without.

2132. (*Professor Petavel.*) This afternoon was no worse than a frosty day in winter?—It was not very good this evening at all.

2133. You would much rather have the steam than the extra work?—We would. I do not find no ill effects from it whatever. That is the truth.

2134. Whereas the extra work you do not like?—No, we could not do without steam. I need not say I could, because I could not, and I do not see that any of them round about me could do without it.

2135. (*Mr. Cummins.*) Do you ever get too much damp?—No, it is just medium.

The witness withdrew.

A—— W—— called and examined.

2136. (*Chairman*) You are a weaver?—Yes.

2137. How long have you been a weaver?—Thirteen years.

2138. Had you worked in any part of the mill before?—No, at other factories. I have been here four or five years.

2139. What sort of health have you had since you have been a weaver?—Very good.

2140. Have you been off sick at all?—Not very often.

2141. When you were off sick was it anything to do with your work?—No.

2142. Did your doctor seem to think it had anything to do with the work?—No.

2143. Have you belonged to any sick society?—The insurance society, that is all I belonged to.

2144. The new one?—No.

2145. Not before that?—No, only the Prudential.

2146. Did you belong to some other society before the Government one?—No.

2147. Do you suffer any inconvenience in your health from the damp?—No.

2148. Or from the heat in the shed?—No.

2149. From a weaving point of view do you think the damp is necessary?—Well, I do not know. It does not affect any body I know.

2150. Could you weave as well without it?—No, you could not, indeed.

2151. Do you ever get too much?—No, we could not weave without dampness.

2152. Do you ever get too much?—No, we never get too much.

2153. What about the weaving to-day?—The steam was off, and it did not do very well. We could not possibly do without steam, we could not weave without it.

2154. What about this afternoon; was the weaving bad this afternoon?—Yes, sometimes it was bad when the steam was off. You could not possibly mind it.

2155. This afternoon?—Yes.

2156. Was there a great difference in the weaving when the steam was on and when it was off?—Yes.

2157. (*Professor Lorrain Smith*) What was the difference?—The yarn works better when the steam is on.

2158. How do you mean; what happens?—It gets broader weave when there is no steam.

2159. Anything else?—No, that is all. Sometimes it breaks out, it rips.

2160. Did it rip to-day?—Yes.

2161. More than before the steam was off?—Yes

2162. (*Chairman*) Had you much piecing?—Yes, we had a brave lot to-day.

The witness withdrew.

E —— O —— called and examined.

2163. (*Chairman.*) Are you a weaver?—Yes

2164. Have you been a weaver a long time?—Over 30 years.

2165. What sort of health have you had?—The best of health.

2166. All the time that you have been working have you had the damp?—I have no fault with the damp.

2167. Do you get too much of it sometimes?—We could not get too much of it sometimes for the yarn. It makes it work better.

2168. For the linen you do not ever get too much?—No, you could not get enough with the linen, mister.

2169. Do you ever get too much for your health?—No, always the best of health.

2170. On the very hot summer days it has never made you feel bad?—Indeed, it never did I never sweat very much. It never took much effect on me.

2171. What about the weaving to-day?—The wefts worked rotten this evening for want of steam. The wefts worked very bad, wanting the steam.

2172. It did not work bad when it was turned on?—No, when it was turned off.

The witness withdrew.

M—— M—— called and examined.

2173. (*Chairman.*) Are you a weaver?—Yes.

2174 How long have you been a weaver?—24 years ago.

2175. What about your health; has it been good all the time, or bad?—Pretty fair; sometimes good and sometimes bad. We have to take the good with the bad.

2176. Have you been off sick at all?—No, never was off sick in my life, unless I have been out a week. Twice I had a quinsy in my throat I was not out sick 10 years and more.

2177. With the exception of those times have you been off sick ever?—Never.

2178. Always been well enough to do your work?—Yes, had to work.

2179. What do you say about the steam?—I say we could not work without the steam at all. Sometimes we could do with less; it is according to the weather If it is a blowy day you want far more. Now this was not a bad day.

2180. (*Professor Lorrain Smith.*) This was a good day?—Yes.

2181. Did you weave pretty well to-day?—Yes, I have a cotton beam and it is not so bad; it never breaks an end

2182. What is the linen one?—That is a 17.

2183. And one cotton?—One cotton. Cotton, you know, works without steam.

2184. But what about the linen one; was that going worse this morning or this afternoon?—Something the same. It slackened down a bit; it worked too slack.

2185 (*Mr. Cummins.*) You would call it a fair weaving afternoon?—Well, we could do better. We had the steam on all day and it was a good weaving day. Whenever it is blowy the work is bad; we have to have more steam when it is blowy.

The witness withdrew.

SIXTH DAY.

Thursday, the 19th day of September 1912.

At Belfast.

PRESENT:

COMMANDER SIR HAMILTON FREER-SMITH, R.N., C.S.I. (*Chairman*).

Mr. HENRY CUMMINGS.
Mr. HERBERT EWART.
Professor J. E. PETAVEL, F.R.S.
Professor LORRAIN SMITH, F.R.S.
Mr. D. R. WILSON (*Secretary*).

Mr. EDWARD T. ADDY called and examined.

2186. (*Chairman.*) What is your occupation?—I am manager of one of the Brookfield Linen Company's factories.

2187. Which factory?—Agnes Street Factory.

2188. And how long have you occupied that position?—About 12 years in charge of the factory, and a considerable number of years prior to that in charge of one of the departments.

2189. Which department?—The preparing department.

2190. We may take it you have a thorough knowledge of matters relating to the weaving of flax?—Yes.

2191. What class of goods do you manufacture?—Fine shirtings, fine linen shirtings, and also union shirtings and domestic linens, such as pillow linens.

2192. How many persons are employed in your factory?—Nearly 300. That is taking all the departments.

2193. How many looms?—In the weaving shed we have 180 weavers.

2194. I am talking simply of weaving?—We have 180 weavers with 328 looms.

2195. Are they all in one shed?—They are all in one shed.

2196. What methods of ventilation have you in that shed?—Extractor fans made by Musgrave & Company—on the shaft on which the drums are.

2197 The fans are on the line shaft?—On the line shaft, yes

2198. Are there any pipes attached to the fans?—The fans are covered in with a pipe from the top, and the air gets in by the side of the fans.

2199. And goes out?—Goes out above the roof.

2200. Have you any special inlets?—Our inlets are through our humidifier; that is, the fresh air comes through the humidifier.

2201. And I suppose a certain amount through cracks and crevices, and doors and windows, and so on?—Yes.

2202. Are there any openings in the apex of the roof or at the base of the roof for ventilating purposes?—No.

2203. Are you sure?—Yes. We have some ventilators in addition to the fans. They are not always open, for sometimes the weavers ask for them to be closed owing to the cold air coming down.

2204. What I mean is, supposing that to be the roof, like that (*indicating*), is there any opening there or here of a permanent nature?—There are ventilators there.

2205. I am not talking of ventilation, but does the roof come down without any opening there at all?—No, there are no openings except underneath the glass; where the glass comes down there is a space.

2206. And will that space admit of fresh air coming through?—It does.

2207. From outside?—Yes, it is quite free.

2208. You have told us the fresh air comes in through the humidifying apparatus?—Yes.

2209. What humidifying apparatus have you?—It is Neill's Patent.

2210. Is it Neill's pure and simple, or has it been improved upon or altered?—Neill's pure and simple.

2211. That is I think that the exhaust steam goes into a chamber, and that it falls as a spray in the chamber and the fresh air is drawn through it?—Yes, quite so. I would like to correct that—not exhaust steam, but water that comes from the engine; that is condenser water.

2212. From the hot chamber?—Yes.

2213. That deals with your humidifying apparatus. Now about temperature. Can you give us any idea as to what you consider a suitable temperature for efficient weaving?—Of course, it depends upon the temperature outside, but about 70° or 71° for the wet bulb and 72° or 73° for the dry bulb gives us good results when the outside conditions are favourable. If very dry outside and wind blowing, we require to raise the temperature in order to get a sufficient amount of moisture.

2214. Now can you tell us in a hot summer—not this summer, but last summer—up to what temperature your wet bulb reading went?—Last summer was an exceptionally hot summer. We had it on one occasion up to 85° in the wet bulb, and 88° in the dry bulb.

2215. What might we take as an average during the hot weather? The maximum average I mean, say for the month of August. That would be a hot month, would it not?—The month of August.

2216. (*Professor Petavel.*) In the afternoon, say?—I should say about 82°. Probably that is too much. I have a note here of the number of times the glass was above 75°. I have that here in each case for each month.

2217. Let us have that, will you please.

2218. (*Professor Lorrain Smith.*) What month do you begin?—You refer to last year.

2219. Yes; we begin in May of last year.

2220. About 75° wet bulb?—Well, we began with 77° and 82°. Do you want them all read out?

2221. I thought you said you had summarised them?—Yes I have a summary here giving the number of days from May to September in each year from 1909 on which the wet bulb temperature exceeded 75:—

1909	42
1910	51
1911	68
1912 (to end of July)	22

2222. There were 68 days last year above 75° wet bulb?

2223. (*Chairman.*) Could you hand that in. Might we have that paper?—You can.

2224. (*Professor Petavel.*) Have you also got the number of days above 80°?—I have it here.

2225. How many days above 80° last year?—Sixty-eight above 75°. I have not the others.

2226. (*Professor Lorrain Smith.*) How many weaving days would there be in that period, May to September?—June, July, August and September, four months of 28 days; say from the middle of May to the middle of September; that would be June, July, August and September.

2227. (*Chairman.*) You said you drew up certain tables showing when the wet bulb thermometer went above 75°?—Yes, I have them here for three years.

2228. Will you tell me why you fix at 75°?—Because I learned that those were amongst the inquiries that were being made.

2229. I daresay you had heard that 75° had been fixed for cotton weaving?—Yes.

2230. Now in your opinion would it be injurious to linen weaving if artificial humidity was prohibited when the wet bulb reached 75°?—There were many days that it would have been impossible. We would have had to stop our factory many days last year.

2231. Have you formed any opinion whether it would be possible to fix any limit at all—say 76°, 77°, 78°, or any limit—at which, without injury to the weaving, artificial humidity might be cut off?—I have not formed any opinion, because I have never seen any way of reducing the height of the dry bulb thermometer.

2232. How would that affect the question? I should like to hear it from you?—Well, if we were able to keep down the height of the dry bulb, of course, we should be able proportionately to keep the wet bulb down. It is the height of the temperature.

2233. You could get the relative humidity more easily if you could keep down the temperature in the shed?—That is so.

2234. Will you tell us if you have tried any special means to reduce the temperature of your shed?—Well, of course we whitewash all the roof, every part of it, and the glass, and I have also tried drawing the outside air through wet screens, through the humidifier in an attempt to reduce the temperature.

2235. When you did that was enough humidity carried forward? I mean to say when you reduced the temperature was the air sufficiently warm to carry enough humidity into the shed?—Well, it was not satisfactory from a cooling point of view; that is say, I was not able to get all the effects that I thought I might expect.

2236. Have you ever tried sprinkling the roof on the hottest days?—No.

2237. What is your roof? Is it a double roof?—It is a single roof.

2238. Simply slates?—Slates, yes.

2239. Is there anything under the slates?—Nothing under the slates. There is a space of about seven inches between the slates and the sheeting underneath.

2240. What is the sheeting?—Ordinary tongued and grooved sheeting.

2241. Is that wood?—¾-inch boarding.

2242. There is a space between the roof?—Yes, the space of the timbers.

2243. Some six or seven inches?—So far as I can remember.

2244. My colleagues will doubtless ask you some more questions, but I think I understand your views in regard to what is desirable for weaving. Now from a health point of view. Have you considered the effect of working in hot, humid atmospheres on the health of the workers?—Well, I have, and I made inquiries from weavers that have been a long time weaving in our shed and in other places. Shall I give you the results of these inquiries?

2245. Yes, certainly?—Just this morning I brought a weaver up to the office and asked her how long she had been with us. She had been with us eight years, and in several other factories. She had been 43 years weaving, and she said she enjoyed good health, and that she would rather do with the moisture and have less work than without the moisture and have to stoop over the looms tying ends and ripping. Yesterday or the day before I asked similar questions of other weavers who were over 30 years with us in our shop, and their testimony was of the same nature. I chose those because I knew they were a long time weaving, and because I knew two of them were a long time in our factory. Of course we know in every trade you can always produce some very old worker who has, perhaps, got great strength.

2246. Can you tell us if any proportion of your workers have had to give up work in early years on account of the heat?—I cannot. I never heard of any who in early years were obliged to give it up because of the heat. There may have been, but I do not know of them.

2247. Can you give us some idea of the proportion of workers that leave you? You have told us how many you have. How many would leave you in the course of a year? Of course they might leave for various reasons?—The condition of trade would cause them to leave. They go to other factories, and come back again to us perhaps after some months.

2248. But amongst the younger ones that leave can you recall, say, during the last year, if any have left on account of ill-health, say?—Only one weaver so far as I remember left because of the heat of the place.

2249. Did she give that as her reason?—She gave that as a reason.

2250. Was she a healthy young woman generally?—She never was away from her work.

2251. Now during these very hot days that you have mentioned last summer, had you any reason to suppose that the workers were suffering discomfort or any excessive exhaustion after their day's work?—Well, I cannot testify to that. I have not heard any complaints.

2252. You have had no complaints?—No, I had no complaints.

2253. (*Mr. Ewart.*) You say that 72° dry, 70° wet, gives you very good results?—Yes, in favourable atmospheric conditions.

2254. Yes, that is what I want to get at. What would the favourable atmospheric circumstances be?—When there is a moderately humid atmosphere outside and no wind.

2255. And no wind?—And no wind. In hot weather where there is wind we could not get sufficient moisture into the shop at those temperatures.

2256. I was going to ask you, have you experience of days that you have difficulty in getting the humidity?—Yes.

2257. First of all do you agree with the established rule here that two degrees is about a proper margin?—Well, there are days when we would like more moisture than would be indicated by two degrees; but in our shop we have some union goods, cotton warps, which do not require so much moisture, and we have to modify it somewhat in order to meet both the linen and the cotton.

2258. Then I go back to the other question——

2259. (*Chairman.*) Might he explain what he means by "modify"?—Well, we might take 2½ degrees difference.

2260. (*Mr Ewart.*) On account of the class of warps you have in?—Yes, on account of our having fine union goods weaving, because the cotton will not weave satisfactorily with too much moisture. That is what we find.

2261. In this locality union goods means cotton warps and linen weft.

2262. (*Chairman.*) You modify it to the extent of 2½ degrees. What I should like to know is whether, when modified to this extent of the linen goods—not the union goods—weave satisfactorily?—Well, with linen goods, we would have fewer breakages in the warp with 2 degrees of difference between the wet and dry bulbs than we would with 2½ or 3.

2263. (*Mr Ewart.*) So that to come back to my original question, you do experience days when you have difficulty in getting the wet bulb to the two degrees limit?—Yes. On one day this week—Tuesday—we found a very great difficulty, with the result that the wet bulb went up to 77½° and the dry bulb was at 80°.

2264. You had to raise the temperature?—As the dry bulb rose we had to pour in moisture, with the result that the temperature in both bulbs rose up to, in the case of the wet bulb, 77½° at a quarter to one or half past 12, the dry bulb would be at 80°.

2265. (*Professor Lorrain Smith.*) You mentioned days when less than two degrees would be desirable for good weaving?—That is for linen.

2266. What kind of days?—Well, when there is a north wind blowing or draughts.

2267. Not specially hot days?—Well, of course in in the summer time it is away above that. It is more wind.

2268. But is it on account of the winds in early spring winds, or is it in summer that this difficulty arises?—Well, there are days in summer also when there is a wind. The wind affects us more probably in that respect.

2269. Then it is more difficult with a summer wind than, say, with a dry east wind in spring?—A dry east wind, yes.

2270. Or is a summer wind just as bad?—A summer wind is just as bad; that is if it is from a dry quarter.

2271. It is not a question of temperature but wind from a dry quarter?—I could not say, but I think both combined.

2272. You do not fear this difficulty so much in the cold?—No.

2273. Then as regards the difficulty of keeping two degrees when the temperature goes up, how does that arise? Cannot you infuse sufficient steam to get the two degrees?—Yes, we are obliged to do that.

2274. But is there any difficulty about it?—There is no difficulty about getting the amount of moisture in excepting in so far that it raises the temperature quickly.

2275. And that result is?—That is we can get enough moisture but it raises the temperature quickly.

2276. That is undesirable?—That is undesirable.

2277. One other point. You mentioned that you had made efforts to keep the temperature down?—Yes.

2278. But you were not satisfied with the result; you were disappointed?—That is so.

2279. Did you succeed at all appreciably? Did you notice any more comfort or any lowering at all?—I cannot say that I did.

2280. (*Professor Petavel.*) You referred to fine shirtings. What numbers would those be? Are they 20's?—Do you refer to the number of the yarn or the set of cloth?

2281. No, I am referring, I think, to the warp numbers?—In linens, say, 75's, and 90's in the warp.

(*Professor Petavel.*) I do not think I have quite what I want now.

(*Mr. Cummins.*) The set.

(*Professor Petavel.*) Yes.

(*Mr. Ewart.*) You mean what we call the hundreds.

(*Professor Petavel.*) Yes.—We have 21^{00}—21 by, say, 22 shots in the weft, which would be 110 threads in the warp and 118 per inch in the weft.

2282. But have you very varying degrees of fineness or are you weaving about the same?—Yes, we have very varying degrees of fineness.

2283. You run between what figures then?—We make all kinds from the coarsest up to the finest.

2284. Would you run from 10^{00} to 23^{00}?—That would be the finest or about the finest. One hundred and ten or 115 in the warp to 118 to 125 in the weft. That would be about the finest in the set.

2285. Now do you find the different sets require different amounts of moisture? Is less moisture required for coarser sets?—Yes.

2286. What difference between the thermometers is required for coarse linens?—Well, it depends upon the nature of the linen. We make some coarse linens that are very closely set that would need the maximum amount of moisture. With other coarse linens that are not set so closely we can do with less.

2287. And yet the trade is carried on in the same shed?—Yes.

2288. That is customary?—Yes. I should say in explanation, with the very coarse linens that do not require much moisture, we do not make them. We make interlinings, that is, thick heavy linen for interlining collars and cuffs, and these linens require the maximum amount of moisture because they are set very closely. Linens that are set more loosely and have not so much strain to bear in the weaving do not require so much moisture.

2289. So you consider the set is quite as important as the coarseness on that point?—Yes.

2290. It requires as much moisture for the close set as for the fine yarns?—Yes, for some of the heavy linens for interlining; for that class of goods we require as much moisture. At all events although the breakages would not be so many because of the yarn being much stronger we find that they weave a great deal better with the moisture than without.

2291. What do you mean by weaving better, if it is not a question of breakage?—Well, it makes a better cloth; the yarn goes together better—the warp and weft go together better.

2292. You say it would be difficult to weave with a larger difference between the thermometers. Have you tried any actual experiments as to the effect of drier air or, less steam?—We have.

2293. Have you woven with four degrees of difference instead of two for instance?—I have worked with five degrees difference.

2294. Could you give us the benefit of that direct experiment?—I took several tests. In the first test we began with a temperature of 72° in the dry bulb and 69° in the wet. This is a test of 17 looms, six running on cotton warps weaving 90 threads per inch in the warp and 97 in the weft. In two hours we had 36 ends broke in those six looms. That is with that temperature. In 18^{00} linen weaving 90 in the warp and 108 in the weft we had 58 ends broke.

2295. (*Chairman.*) In how long? I think you told us?—Two hours. In the 21^{00} weaving, 105 in the warp and 118 in the weft, we had 60 ends broken in two hours on five looms.

2296. (*Professor Petavel.*) We have six looms on cotton and five looms in this last batch; how many looms in the middle batch?—Six.

2297. Seventeen looms altogether?—Yes; six on 17^{00} unions, six on 18^{00} linen, and 5 on 21^{00} linen. The second test we took with a temperature of 74° for the dry bulb and 69° for the wet bulb, and no moisture excepting what might be in the shop.

2298. These two tests followed on?—The first test we had on Friday morning and the second test we had on Monday.

2299. Would you consider the two days about the same for quality of weaving?—We have heard so much about bad days and good days. On Friday in the outside air there was a difference of four degrees between the two bulbs, and on Monday there was a difference of seven. The result of the second test was, we had 63 ends broken in the cotton and 88 in the 18^{00}, and 70 in the 21^{00}.

2300. (*Professor Lorrain Smith.*) That is for two hours, I suppose?—That test on the Monday was conducted in the afternoon, and the difference in the two glasses was not 4 but 7 degrees, that is, 64° for the dry bulb and 57° for the wet bulb. It was conducted in the afternoon.

2301. (*Secretary.*) That is the outside temperature?—The outside temperature was 64° and 57°.

2302. (*Professor Lorrain Smith.*) On one day there was a difference of four degrees and on the other seven?—Yes.

2393. (*Professor Petavel.*) That is the shade temperature?—Shade temperature.

2304. What was the temperature of the factory on that day during the second test?—The temperature in the factory was 74°. We began with 74° and 69°.

2305. Is that a serious difference from the wage earning point of view of the employees or the quality of the cloth resulting from it?—Would you like another test.

2306. Yes, I should.—A third test; six looms weaving 17^{00} unions. 17^{00} would be 85 in the warp and 92, say, in the weft.

2307. (*Mr. Ewart.*) Were those linens or unions?—This is a union. Six looms on 18^{00} linen and six on 21^{00}. In the cotton we had 24 ends broke in two hours; linen 24 (that is the 18^{00}) and the 21^{00}, 41.

2308. What was the temperature in the shed?—This was the temperature with the moisture on. We began with 73° in the wet bulb and 75° in the dry.

2309. Did you notice the temperature outside?—The temperature outside was 63½° in the dry and 56° in the wet. The temperature in the shop, we began with 75° in the dry and 73° in the wet, and we ended with 80° in the dry and 77½° in wet. In the unions we had 24 ends broken, also in the 18^{00} linen, and in the 21^{00} we had 41 ends broke. The fourth test without any moisture we began with a temperature of 73° in the dry and 68½° in the wet, and we ended with 75° in the dry and 70° in the wet.

2310. Have you the outside temperature for that experiment?—The fifth test, 60° in the dry, and 55° in the wet bulb outside. In the test without moisture, in the cotton we had 31 ends broken in the same looms.

2311. The union, yes?—On the 18^{00} linen we had 60 broke. On the 21^{00}, 61 ends broke.

2312. (*Chairman.*) In how long?—Two hours.

2313. And on how many looms?—Six looms in each case. These are all the tests.

2314. (*Professor Petavel.*) Perhaps it could be summarised by saying it is one-third more breakage?—Yes, on the average.

2315. What would be the result with regard to the wages of the operatives and the quality of the linen?—With regard to the effect on the operatives, I can only give you the opinion of those weavers I referred to—that the amount of ripping and tying of ends that would take place without moisture, and bending over the looms so much would be more serious to them than moisture. I should say that during the time the last test was going on, in the time that I walked from the bottom of the shop to the top I saw nine weavers ripping.

2316. A breakage does not necessarily mean a loss of wages, unless two looms happen to be stopped at the same time?—Of course, every time an end breaks that means stopping the loom.

2317. It is some small loss. What would it amount to in wages? Can you give us any idea what this difference means in wages?—I cannot.

2318. Was the cloth appreciably worse? Would it be depreciated in the market?—In the class of goods we make much of it would be unsaleable for the purpose for which it is intended. Ripping, for instance, is one of the worst possible faults in fine shirtings.

2319. And there was more of that?—Yes, from the time that I walked from the bottom of the shop to the top I saw nine weavers ripping. On an ordinary occasion you would see two on an average.

2320. (*Professor Lorrain Smith.*) That does not appear in your tests?—No, it does not appear. I made that trial just to see the result.

2321. Then the ripping is just as dependent on the moisture as the breaking?—Well it is often the breakage of the yarn that brings about the necessity of ripping.

2322. (*Mr. Ewart.*) I think I am right in putting it this way, that when there is much breaking the damage is bigger and there is more ripping—a longer rip back?—Yes.

2323. I put it that way because Professor Petavel suggested the other loom was making good money all the time?—It often happens—in fact it invariably happens—that when there is much ripping out at one loom a big fault may be occurring in the other loom, where the weaver would have to begin and rip 1½ inches or more.

2324. You have Neill's system of humidification?—Yes.

2325. How do you get the air into the shop? Have you a fan?—Yes, we have a fan.

2326. Does the fan draw through the chamber or blow through it?—Yes, it draws through the chamber.

2327. And then blows into the shop?—Blows into the shop through a trunk.

2328. How is the fan driven?—By belt.

2329. Does the belt ever come off?—No, or very rarely.

2330. It has come off?—Yes, it has come off, but we put it on very soon.

2331. I just want to get at that. How do you know it has come off?—The belt is outside of the shop and the fan is inside the shop. The fan is driven inside the shop from one of the shafts.

2332. Do you discover that the belt is off because of the change of the atmosphere, or do you discover it by somebody observing it?—It is seen immediately. It is right overhead.

2333. Would the belt fall on somebody's head?—We have a net underneath.

2334. It is never off long enough accidentally to change the conditions?—It is never off unless we put it off for some reason in order to make some alterations.

2335. (*Chairman.*) Is there anything else you would like to say?—I might say that when we began to make the tests I had every web measured in width and marked, and without the moisture measured again in each case, and we found the cloth going out half an inch and three-quarters of an inch in width, with the result of course that the warp and weft would not be laid closely together; the two sets of thread would not be well bedded into each other; the cloth would be comparatively raw and open.

The witness withdrew.

Mr. DANIEL DRENNAN called in and examined.

2336. (*Chairman.*) What is your occupation?—I am manager of the Lurgan Weaving Company, Limited.

2337. How long have you been manager of these works?—About 22 years.

2338. And have you any former experience?—No, not previous as manager, but I have as engineer-in-charge.

2339. But you managed these works for 22 years?—Yes.

2340. Will you tell us the class of goods that you manufacture in your shed?—They are all fine cambrics.

2341. How many sheds have you?—Just the one.

2342. Can you tell us anything about the cubic capacity of the shed, the size of the shed?—The cubic contents, 515,296 cubic feet. That is on all the humidity records.

2343. How many weavers?—There would be about 324 when the shop is all going with 626 looms.

2344. Will you tell us how the room is ventilated?—Well, we have 10 exhaust fans, each of 20 inch diameter, equally distributed over the room.

2345. Are they exhaust fans?—Yes.

2346. Have you any special inlets?—No, they are all exhaust fans.

2347. Do you take any particular means of keeping your shed as cool as possible?—Nothing but what the exhaust fans will do. We have no other means.

2348. Is the roof whitewashed in summer?—Yes.

2349. Have you ever tried any roof spraying in the hot weather?—We have not. The whitewash is just taken off now; we have it on all the summer.

2350. What about covering the pipes? Are the steam pipes covered with any insulating material?—Yes, they are all covered with non-conducting composition. The first application is asbestos, and the other is a mixture of asbestos and some other material all covered up to the flanges whatever the depth of flange may be.

2351. You have a humidifying apparatus of some sort, I take it?—Yes.

2352. For introducing artificial humidity?—We have, yes.

2353. Of course, you consider that necessary, or you would not have it there?—Oh, absolutely.

2354. What system of humidifying have you?—It is the steam jet.

2355. Steam jets distributed over the room?—All over the room.

2356. Have you ever tried any other system?—We have not.

2357. Were it suggested to you to stop the introduction of artificial humidity at 75° wet bulb, what would be the effect of that upon your weaving?—To stop the introduction of the artificial humidity entirely?

2358. Yes, when the wet bulb gets to 75°?—It would be impossible to work fine linen yarns. It would be disastrous both to the worker and to the manufacturer.

2359. In what way disastrous?—The worker would not be able to weave fine linen yarns at all without humidity.

2360. Would you go so far as to say you would not be able to weave at all?—I would, in fine linen yarns. In fact, I had an experience of that both in linen and cotton which makes me come to that conclusion.

2361. Will you give us your experience?—In 1908, I think it was, there was a class of goods manufactured from cotton warps called Shamrock Lawns—very fine cotton warps. Our firm thought of participating in this, and they provided the necessary preparation machinery. We got the work forward ready for the loom and put those fine cotton warps (the weft was linen) into the looms in the humid shed with the result that we could not get them woven.

2362. Was there no humidity then?—Yes. The humidity destroyed them altogether. The cotton was so so fine it would not leave the shell of the loom with the humidity. Then we found we would have to complete our engagement for these goods. We took some heavy orders. We partitioned a portion of the shop off and we stopped humidity altogether and put a heating pipe down for damp days and we got away with the work all right. We had no difficulty at all, but the orders for those goods ran out. We had gone to a great deal of expense in fixing up the shop for the cotton and we thought to keep our looms going. Then we put fine cambrics into this cotton shop as the looms emptied, and we could not get one yard of perfect cambric cloth woven for the want of humidity.

2363. You had none?—No. Thinking to keep the cotton going and to fill up empty looms with cambrics until it was time for cotton to come round again, we excavated under each loom where the beam is, to about nine inches. We thought that by filling that with water we would get sufficient humidity off it with the heat of the place to humidify the yarn for weaving purposes but it was no use.

2364. Do you know what readings on the thermometers you got then in that shed?—No, I could not say.

2365. You did not notice?—No, we did not put a thermometer into that shed. We had only 100 looms in it.

2366. If you had no thermometers you cannot say what relative humidity you had?—I could not, but we had no artificial humidity. We thought that by doing that we could work the two goods in the one place, but we could not; it was impossible.

2367. Have you considered this question? You have told us that to shut off steam or humidity at 75° would be injurious. Have you thought of any point where it might be cut off without injury to your trade?—I could not, because so very much depends on the atmospheric conditions outside with regard to it. It would be impossible to define the point.

2368. Have you ever heard from weavers or from your experience complaints as to weaving? I am not talking now as to health, but as to weaving with too much moisture?—I have not, but there is a general complaint of too little.

2369. Have you ever heard of the warps sticking on the back shell?—Well, that can occur, but only in one way If a fine loom is left lying off for a day or two and you have an extra amount of humidity when a worker is out at any time, the damp will get into the yarn on the shell and it will not weave satisfactorily, but when the weaver has woven that portion of the yarn in the rest of the beam goes on all right I have never seen it occurring during ordinary working hours with the loom kept going

2370. Have you any statistics in regard to the heat in your shed? Did you bring any figures with you showing the heat?—No, nothing, only the readings go to the Home Office every month

2371. Yes, but you did not bring any copy with you?—I have one copy only. we do not keep a copy.

2372. What month is that?—This is August, last month.

2373 This year or last year?—This year.

2374 August of this year was rather cool?—It was. August last year was a very hot month.

2375 What is the highest in the wet bulb that you got to last August?—Well, the highest here is 78°, in the dry 79°, 74°, 76°, 78°, and 79° is the highest

2376 In the afternoon?—That is the afternoon

2377. What day?—79° is the 28th, 78° on the 27th.

2378 Now looking at this question for the moment apart from weaving conditions, considering it from the point of view of health, have you formed any idea as to whether working in very hot temperatures such as you would get in hot summer weather, is uncomfortable to the workers or injurious to their health?—Well, I can say I have never had any complaints, but unless you are clothed according to the high temperature of course you would feel uncomfortable I do not believe it is unhealthy at all I would say a place where there is dust would be much more unhealthy than where there is a certain amount of humidity.

2379 I think the danger of dust has been recognised a long time in this district, and a great many precautions and measures have been taken to reduce the dust as far as possible?—Well, I have been working in spinning mills and weaving factories for forty years and I have never been off a day sick in my life and I am not more than one hour in each day outside the weaving factory

2380 What is your experience of the workers: have they to go away sick often or not? Of course naturally they would go off sick, but I mean from reasons which might be attributed to their work?—Not from my knowledge We have a good many people sick in all the departments now and again. Of course that occurs in every department in a weaving factory, but not from any effects of the work that I have ever known.

2381. Have you any sick club or anything of that sort in your works?—No.

2382. Are there any statistics which you could give us to show how often the workers in the weaving shede are off from causes of sickness?—No, we have no record of that at all, but I have never heard any of the workers say that they have been compelled to go home from injurious effects of the work.

2383. I will just put to you this question, though you may not be able to give an answer. In the cotton industry a ballot was taken of 70,000 weavers, and of the 70,000, 67,000 demanded to work without any steaming whatever on the ground that it was injurious to their health. Now in the face of such evidence would you consider that it was the duty of the Government to make some inquiry into such a question?—Certainly I would consider it was their duty in face of that unquestionably.

2384. Then is there any reason to suppose that if cotton weavers suffer from humidity linen weavers should not suffer?—They are two very different fabrics altogether. I have explained to you our experience of extra-fine cotton weaving Of course, with 80 single twist to 130 single twist, Egyptian cotton in the class of goods we manufactured, no humidity of any description is required

2385. But I am talking now of where humidity is wanted in the cotton sheds I have no experience of it.

2386. Well, as a matter of fact if we tell you that generally speaking there is humidity, can you see any reason why it should, in the opinion of the cotton operatives do injury, and in the opinion of the linen operative do no injury?—I could not.

2387 You cannot account for it?—No

2388. Perhaps not. I quite accept your statement?—I have no experience of the cotton further than I told you.

2389. In face of the evidence relating to humidity in the cotton sheds which has been printed and is now public property, do you think it right and desirable that there should be a similar inquiry into the conditions of the humid sheds in Ireland?—I think it quite right and proper to have an inquiry I think myself that a great deal might be done to make more comfortable working conditions by introducing fresh air into the sheds. That is to say, by forced air and by a better system probably of exhaust fans, but my own opinion is that to interfere with the free use of humidity would be ruinous both to the worker and the manufacturer in fine linen cambrics.

2390. Then you are of opinion that by a better system of ventilation and the introduction, as you say, of fresh air, something might be done for the comfort of the workers?—Unquestionably that is my opinion

2391. But have you considered it from this point of view, that if you introduce more fresh air you have greater difficulty in getting the humidity?—No doubt you have greater difficulty, but a great deal depends on the class of humidity that you use. For instance, we believe that the steam jet humidity the hot air mixing with the yarn, is a better class of humidity than the class that is being introduced at present, cold moist air

2392 But would not the cold moist air tend to reduce the temperature in the shed?—It would tend to reduce the temperature in the shed, but it would not be as good for the weaving of the yarn

2393 But then you were talking about the comfort just now You made a suggestion that by introducing more fresh air and having more fans, things might be made more comfortable. Now, if you could give it to us, we should be very glad to have some practical suggestion as to how that might be done? Really, I have not gone into this matter with regard to getting any evidence at all That is for the scientific gentlemen here to work out I am just giving my evidence as a working man through the place. I have provided nothing special for you When I got the word to come here, I came to that conclusion in my own mind.

2394. Of course, we should like very much to do something to make it more comfortable, but as I put it to you before, might it increase your difficulties in regard to weaving?—No doubt it would

2395. Would you be prepared to accept that?—But if no standard of humidity was put down for us and we were allowed free use of humidity, I believe you could introduce a system of fresh air that it would be possible to work with.

2396 (*Mr Ewart.*) I do not understand that last statement. Do you mean, if the two degrees limit were removed?—I do not say altogether removed. Supposing we got a limit of one degree, say, between the two bulbs which produced better weaving conditions, I believe we could then form some system of introducing fresh air that would be a benefit to the health of the workers, and yet that we would be able to work with—provided that no standard was made for the humidity and we were allowed a difference of one instead of two degrees When I got word to come here I could not see how, in fine cambric weaving, the free use of humidity could be interfered with, but I did think that something could be done by the introduction of fresh air and a better system of exhaust fans. That is my opinion on the matter

2397. (*Chairman.*) Yes, but, say you had only one degree difference the air would be nearly saturated, would it not?—Yes, but I have never seen the air in the weaving shed at dew point in my life.

2398 But what you suggest would bring it within one degree?—Yes

2399. Then immediately you began to introduce the air as you suggest, the difference between the thermometers would immediately get wide. Is not that so?—That is so, but with the free use of humidity we may be able to counteract that.

2400. I am suggesting that to you to think it out?—Of course, the question arises if it is dry air it would give us more difficulty, but if we were allowed the free use of humidity we may be able to combat that. I have not studied the matter. It is only a suggestion. When I got the word to come here I did not give the matter any study. It was simply a suggestion that dawned on me. I will tell you one certainty. The best working conditions in a fine cambric weaving shed is when you see the humidity showing itself on the floor of the shed. Those are the best working conditions for the worker and for the perfection of the cloth.

2401. (*Professor Lorrain Smith.*) That is as compared with the roof?—When it appears on the floor of the shed.

2402. Rather than on the roof. One sometimes sees it on the roof?—Well, a good deal depends on the class of roof. If you have steel girders on the roof it condenses quicker than on the wooden beams. Ours is all wooden beams. I find that when the humidity commences to show itself on the floor of the shop it is the best working conditions. That is from the weavers themselves.

2403. (*Professor Petavel.*) You said fine cambric. What would that be?—We work up to 24^{00}. You have to put into your shed 10^{00} here, 16^{00} here, 19^{00} here, and a 24^{00} there, or a 22^{00}, as the case may be.

2404. So you go right away from?—10^{00} up to 24^{00}.

2405. Is there a great difference in the amount of the moisture required?—You could do with less moisture for a 10^{00}.

2406. A great deal less?—Yes, but then you see you have to mix through your shop everywhere. You have to give them to the workers that they suit, and you have to do the same with the fine work.

2407. All factories have a large range of goods in that way?—All cambric factories have the same range that we have. I do not know whether they all go as low as a 10^{00}, but occasionally we make one to suit a customer who gives us his other work, but they all go to 11^{00} and 12^{00}.

2408. You told us you were weaving without any moisture in a shed that was heated with steam pipes?—That was fine cotton warps.

2409. Quite so, but you say it was successful?—Yes.

2410. Have you ever tried with rather less moisture with three or four degrees between the bulbs?—The weaving conditions are immediately bad. The workers come and complain immediately you get three degrees. In fact, they go and turn on the steam themselves.

2411. You have not any actual figures you could give us to show that?—No, I have not, but it is a general complaint with them if you get three degrees of difference between the bulbs, and if it stands for any considerable time they are immediately with you. In fact, they will go and put the humidity on themselves. They do it very very often. Some of the weavers have been with me since they have heard of this and have complained of any reduction in humidity—a great many of them.

2412. (*Professor Lorrain Smith.*) You never heard complaints of their being unduly exhausted at the end of the day with the day's work?—No.

2413. (*Professor Petavel.*) Not even last summer during the heat?—No, I had no complaints of exhaustion. I was in the shop all summer myself. I am not more than an hour a day out of the shop as a rule, and I felt no excessive exhaustion myself. For instance, if you take a dressing shop you would get 115° to 120°.

2414. That is very dry, of course?—Yes, all the same they are sweating all the time continuously.

The witness withdrew.

Mr. JOSEPH LEATHEM called and examined.

2415. (*Chairman.*) Will you state your occupation?—Inside manager.

2416. You are inside manager at what works?—Johnson, Allen & Co.

2417. What is the name of the works?—Woodvale Factory.

2418. In Belfast?—Lurgan.

2419. How many weaving sheds have you?—Two.

2420. And how many workers in each?—There are about 300 workers in the one shed and about 200 workers in the other. There are 472 looms in the one shed and 300 in the other. That is taking an average of two looms to the worker. Of course there are some odd ones.

2421. Are the two sheds constructed alike?—Quite the same.

2422. Do you manufacture the same class of goods in both?—Yes.

2423. Are they ventilated in the same manner?—Just the same way.

2424. Will you tell us how they are ventilated?—By Blackman's fans in the roof, extracting fans.

2425. How many in each shed?—There are ten in the large shop and eight I believe in the small shop. I am not quite definite about the number in the small shop.

2426. Are there any special inlets for the ventilation?—No, nothing special. Of course down the centre of the shop there is a space. That is the preparing space which is an air space between the two sheds. The doors are open and there is an air space down between the two, and that ventilates the shops to a great extent.

2427. Of course you use artificial humidity?—Yes.

2428. How do you humidify?—Steam jets.

2429. Have you ever tried any other system?—No, we have tried no other system.

2430. You have only tried steam jets?—Yes.

2431. What difference between the thermometers do you think best for your work?—Well, from my judgment about two degrees, and I have had a very good test of it. For years I attended to it personally myself. In some cases it is better under certain circumstances with 1½ degrees, but taking it generally about two is a fairly good condition for weaving.

2432. What would be the effect of weaving with, say, three degrees difference?—It would be bad.

2433. In what way?—Well, in many ways, both for the making of the cloth and the yarn breaking as well. In the two sheds we have, the one is more difficult to keep to the same degrees than the other—that is the last shed we put up—because we have not it filled with looms and there is a greater air space. That is one of the reasons. Another reason is that No. 2 shed is elevated from the road and in the other, No. 1 shed, it is the opposite way; that is, we are sunk, we are below the road, and we find it more difficult to keep No. 2 shed right. We have a great many more complaints in that shop because it is more difficult to keep it right.

2434. To keep within two degrees?—Yes, it will go over the two degrees. It is difficult to keep to the two degrees in it because of the amount of air space in it. Of course, if it was filled with looms, that to a great extent would be a thing of the past.

2435. I take it that managers and overlookers and weavers generally hold the opinion that a difference of two degrees is about right?—Well, I really could not say what the weavers hold about that I am sure.

2436. Have you ever discussed it with anybody else?—No.

2437. That is your opinion?—That is my opinion, yes. Independent of the degrees before we used the bulb at all, I could tell by going into the shed when it was in good condition. That is a state you get to know from experience. You know the state of the shed.

2438. You may be right—possibly you are right—but for the sake of evidence can you tell us whether you have made any experiments by weaving, say, with a difference of 2½ or 3 degrees?—We have never made any experiments for the sake of evidence. and the only experience I have had is between the two sheds. I have had that several times.

2439. What is the result?—The result is, there is worse weaving in the one than in the other, and a demand for more moisture in the dryer shed

2440. What do you consider is the right temperature? If you could arrange to have what you like, what would you fix it at?—An all-round temperature.

2441. Yes?—I believe myself we get a very good efficiency anywhere about 70°, 71°, or 72°. From my own experience I consider that is about as good efficiency as there is for weaving, if you could keep to that.

2442 Is that wet or dry bulb?—Well, say the dry at 70° and the wet at 68°, or say up to 72° for the dry and 70° the wet Round about that I think it is about as good for weaving from my experience as at any other time.

2443 You probably have heard that regulations have been made for the cotton trade?—Yes.

2444. And that artificial humidity is cut off at 75° wet bulb?—Well, I have never heard anything definite about it.

2445. Well, I tell you that that is the state of things?—Yes, quite so.

2446. What effect would that have upon the fine weaving trade?—Well, of course it depends. If we had two degrees of difference when it is at 75° we would be all right.

2447. Supposing at 75° the steaming was cut off, what would happen, do you think?—Well, of course it would be disastrous. That is if on a certain day we had to cut off when the wet bulb came to 75°, and the difference between the two came to three four, or five, degrees, it would be very disastrous in the sheds

2448. How long after cutting off the steam would the effects begin to show themselves?—It would show itself in half an hour—less sometimes In fact the atmosphere itself shows the change When there is a drying day and the wind changes and it comes on to rain you can tell the change in the sheds in twenty minutes or half an hour at the outside.

2449. You remember probably that the summer of 1911 was very hot?—Quite so.

2450. From your observation or from any remarks made by the workers do you suppose that on the very hot days they suffered from exhaustion at their work or after their work?—There is no question that on some of those days it was a little bit suffocating. Of course that was a most extraordinary summer for us to have In that case we went up as far as 85°

2451. (*Professor Petavel.*) 85° wet bulb?—Dry bulb, with two degrees of difference. Of course that is a most extraordinary thing to get, but I have found in most cases so far as the summer heats are concerned on the whole there is very little room for complaint when you come to about 80°, but after that there is no doubt about it, you feel it then. That is 80° in the dry.

2452. After 80° dry then the workers suffer discomfort?—More or less certainly.

2453. What is the highest you say you went up to?—I think June is about the hottest I have here. We have a register here for June from 87° and 85°.

2454. And then there was four degrees difference?—Two.

2455. The dry bulb was at what?—Eighty-seven degrees

2456. And the wet bulb at what?—Eighty-five degrees.

2457. Then with your humidifying apparatus you could get up to within two degrees?—Yes. In fact, on some of those hot days it is easier to get to it than when the temperature is a great deal lower so far as the moisture is concerned. Sometimes when we are running below 70° in the colder time it is more difficult to get the two degrees difference than what it is on warm balmy days

2458. (*Professor Lorrain Smith.*) That is on the windy days?—Yes.

2459. Cold windy days?—Yes, quite so.

2460 (*Chairman.*) I will ask you this. You may be able to answer it or not. I want to try and get from you, whether the conditions in cotton weaving and flax weaving account for the difference of opinion as to health held by the workers in this country and in Lancashire Now I will have to explain myself. A ballot of 70,000 Lancashire weavers was held and 67,000 were of opinion that working in a damp atmosphere was injurious to their health, that steaming was injurious to their health, and they demanded that there should be no artificial humidity whatever. The remaining 3,000 thought differently. Of the weavers whose evidence we took—and there were a great many—nearly all said that they would prefer having more work and less wages rather than more moisture, and they accounted for that fact by saying that their health suffered Now, on the other hand, here we are told pretty well on all sides that the health of the weavers in humid sheds does not suffer. Can you account for that difference at all?—No, I can make no account for that

2461. Do you think in the face of these facts (and they are now facts which have been published in an official blue book which can be had by anybody) that an inquiry is necessary to see why there should be a difference of this kind in England and Ireland?—From the health standpoint I do not know anything about that. Of course I know that the cotton weaving and the linen weaving are two different things. Of course I quite follow you.

2462. I ask you if you think an exhaustive inquiry is desirable to try and solve this?—I certainly do not think it can do any harm. From my knowledge of the masters I do not think they would oppose anything for the benefit of the worker.

2463 But supposing it was suggested that the regulations made for Lancashire should be imposed upon weaving sheds in Ireland without any inquiry, would you think that desirable?—I would not.

2464 You think if there is any legislation for Ireland, either to alter things or to leave things as they are, that it should be after careful inquiry?—I do, and I think also it should be dealt with on its own merits.

2465. (*Mr. Ewart.*) You said you had not heard about the changes actually in force since the 1st of April last I think it is?—No.

2466. If the wet bulb temperature inside the factory goes up to 75° all steaming has to be stopped?—No, I did not know that at all. I did hear there was a regulation made in connection with cotton recently, but that I did not know.

2467. Supposing it was proposed to introduce that in Ireland, how would it affect the plain linens, the cambrics and such like?—Of course so long as the atmosphere would be in such a state that we could get, or if there were any means of keeping two degrees of difference, it would affect us nothing at all.

2468. Reading that answer another way it means that once the dry bulb temperature went up to about 77° you would not like it?—No.

2469. What do you say if it went up to 87°?—After that the results would be worse every degree it went up.

2470. Would it be possible to work at 87° dry, 75° wet?—I hardly think it would It may be possible to work but to get it done properly is another thing.

2471. To make marketable cloth?—No, I do not think so. I have had about thirty years experience, and where I have had one complaint of too much moisture, I have had one hundred complaints of not having enough

2472. (*Chairman.*) You said you had complaints of too much moisture. What were the conditions then?—Well, the complaints of too much would be this A weaver may have been out perhaps and the loom may have been lying off for hours, or for perhaps a day, and when he comes in and starts working at it may be a very fine cambric, he may complain of having too much damp on his particular web and yet there are three or four looms round about at the same time and there is no complaint about them at all.

2473. What would be the effect of having too much damp on his web?—It would be a little bit catchy, or sticky, but his neighbouring workers round about would be just right. In cases of that kind sometimes we stop one of the jets on to that particular loom for the time being.

2474. (*Professor Petavel.*) I would just like to ask you what class of material you weave. Fine cambric, is it?—All the finest cambrics.

2475. Up to what set?—Well, we will take the numbers. Our coarsest would run about 65's to 70's.

2476. (*Mr Ewart.*) That is the numbers of yarn?—Yes, the lea.

2477. (*Professor Petavel.*) Now the sets?—From 11^{00} to 23^{00}.

2478. Do you consider all those need the same amount of moisture?—Pretty generally. It makes very little difference.

2479. Could the coarser cloth be woven with less?—Well, it could be woven with a little bit less for this reason and this reason alone, in my judgment, because it is stronger.

2480. Would it be practicable to classify the cloth so that one part of the factory could be kept suitable for the coarser cloth and therefore less damp, and another part suitable for the finest and therefore presumably more damp?—I have had no experience of anything outside that line I am telling you, and from my experience I do not know that you really could.

2481. It would be too inconvenient in the management?—Quite so.

2482. (*Mr. Ewart.*) Following up Professor Petavel's explanation of that, is it necessary in your shop, to enable your weavers to keep two looms going, to give one what you would call a coarse web, say 13^{00}, and in the other loom a finer web?—That of course depends. It has nothing to do with the moisture; it has only to do with the ability of the worker.

2483. To enable you to get full value out of your looms and worker and to let the worker earn full pay you have to give a lower set and a finer set?—Yes, but we have not experienced that very much.

2484. You have heard of it in the trade?—Yes, certainly, I knew that that is done to a great extent, but we do it very little except in the case of younger boys with less experience. We do not do it very much. We have men in the place we can put in two 22^{00} to, and on the other hand again it may be they are weaving 14^{00} or 15^{00}.

2485. Have you any girl weavers?—No, we have not very many girl weavers. We used to have a great number of girl weavers, but they have got on to hemstitching and finishing. They are mostly employed on that. We had more girls when I went there first than what we have at present.

2486. (*Chairman.*) Did I ask you if your sheds are whitewashed?—No, you did not, sir, but they are.

2487. What is the roof, slates?—Slates and glass.

2488. And underlined inside?—With sheeting.

2489. What is the distance between the slates and the sheeting?—I could not answer that. I should say it would be four or five inches.

2490. Have you ever tried spraying your roof in summer?—No, but this summer we whitewashed the slates as well as the glass.

2491. That was the first summer?—The first summer.

2492. Did it produce any effect?—I believe it did although the summer we have had did not give us as good a chance of knowing it, but I certainly believe it would have been a factor in hot weather.

2493. You have told us that during the very hot days the workers suffered at any rate discomfort from the heat?—Certainly. Of course there is no question of that. I do not suppose if our registers were looked up for years they would register at any time over 80° in the old shop. That is the dry bulb. It might run a little higher but I should think not very much.

2494. Can you offer any suggestion for making it more comfortable for the workers on those very hot days?—I do not know that I could, but I do not know that it is impossible for something to be done.

2495. We are very glad to get suggestions from practical men?—Quite so.

2496. Indeed we rather look to practical men to help us in these matters?—I think the probability is that this Inquiry might bring that more about because men who have not before thought anything about it will probably put their heads together and see what really can be done.

2497. But you have not yet formed any opinion on that point?—No, I have had no experience of any of these other systems with the exception of ours. Of course I am personally of the opinion that for linen weaving—that is for the doing of the work—there is nothing to beat the steam jets, but in the heat of the summer it is just possible at that particular time when there would be discomfort something could be done to bring the temperature down a bit and keep the same results. If we could, that would be all right.

2498. Of course your steam pipes are covered?—Yes.

The witness withdrew.

The following four witnesses were operative spinners selected by the Secretary from the spinning rooms of a mill visited by the Committee.

E—— H—— called and examined.

2499. (*Chairman.*) You are a spinner, are you?—Yes.

2500. How long have you been a spinner?—Seven or eight years.

2501. Have you been healthy all the time?—Yes.

2502. Have you ever had to go off by the doctor's orders?—No.

2503. Not in the seven years?—No.

2504. Which spinning room do you work in?—The middle one, No. 1.

2505. Do you feel it comfortable at your work?—Yes.

2506. I see you have an apron on. it is waterproof?—Yes.

2507. That is to keep the wet off you?—Yes.

2508. What do you have to keep it off from the waist up to your neck?—We have the bib on when we think to put them on.

2509. Have you got it now?—Yes.

2510. Let us see it?—Yes.

2511. What is the good of it there? Why don't you put it up here? Tell us why you do not wear it?—I do not like it up there.

2512. Why not?

2513. (*Mr Ewart.*) Is it the look of the thing or is it uncomfortable?—Yes.

2514. Uncomfortable?—Yes.

2515. (*Chairman.*) Does your blouse—that is what you call it?—Yes.

2516. Does that get wet?—No.

5517. Never gets wet?—No.

2518. Would you mind my feeling to see what it feels like? It is pretty damp. When you go away from your work in the evening do you put something over that?—Yes.

2519. Do you take it off or do you put something over it?—I have a jacket for putting on top of it.

2520. How far do you live from the mill?—About half an hour's walk from this.

2521. On a cold day do you never feel cold about the chest?—No.

2522 What about the heat: do you feel the heat too much or too little?—No.

2523 You do not feel it too much?—No.

2524. Have you ever used splash guards? Do you know what I mean by splash guards—those boards to keep the water from splashing. Have you ever seen them?—Yes.

2525. Have you ever worked with one?—No.

2526. Then you do not know whether they are good or bad. I suppose you have never tried one?—No.

2527. So you cannot say if it would be a good thing or a bad thing, I suppose?—No.

The witness withdrew.

J—— O—— called and examined.

2528. (*Chairman*). Are you a spinner?—Yes.

2529. How long have you been a spinner?—About nine years.

2530. Have you worked all the time in this mill?—Not all the time. I left twice.

2531. Why did you leave?—I left to go to the factory one time.

2532. Have you ever left because you were ill?—No.

2533. Have you ever had to see a doctor in all that time?—No.

2534. Never had a doctor?—No.

2535. You have never been off work on account of your occupation?—No.

2536. I see you have a waterproof apron on?—Yes.

2537. Is there a bib for that?—Yes.

2538. The bib is not much good where it is now, is it?—No.

2539. Why do you not put it up?—It is too warm sometimes; we cannot wear it.

2540. Does your blouse get wet?—No.

2541. Can you think of any kind of blouse that might be worn—supposing it was made of, say, flannel that you could take off after your work would you wear that?—Yes.

2542. You think you could wear that?—Yes.

2543. Do you know what I mean by splash guard—those sort of things to prevent the water from splashing on you?—On the frames?

2544 Fastened on the frame, yes?—No.

2545. You have heard of them?—No.

2546. Did you ever try one?—No

2547 What about the heat in the spinning room Take a cold day or a hot day, which is the best for working for you, the most comfortable?—It is much the same all the time.

2548 To day are you working comfortably?—Yes.

2548. Quite comfortable?—Yes.

2550. You do not feel any more tired than you would on another day?—No.

2551. (*Professor Petavel.*) We have heard that some of the spinners suffer from sore feet. Have any of the girls to your knowledge complained of that, or do you suffer yourself?—No, I do not.

2552 You are quite sure it does not affect you?—No.

2553. (*Chairman*.) Now about your clothing. Where do you put your clothing when you are at work?—We have a cloak room.

2554. Do you change your things before you go home?—Yes.

2555 Do you put on another blouse?—Just if I like.

2556 What do you do? Do you generally put on another, or do you not?—No, I do not put on another.

2557 In winter would you keep on the same blouse to go home in?—No, not in the winter time

2558. In the winter time you put on another?—Yes.

2559. That is to prevent catching cold?—Yes.

The witness withdrew.

L—— J—— M—— called and examined.

2560. (*Chairman.*) You are a spinner?—Yes.

2561. How long have you worked in the spinning rooms?—About six years at this one.

2562. What were you doing before that?—Laying on.

2563. That would be in the spinning-room?—Yes.

2564. (*Mr. Ewart.*) You began at the doffing?—Yes

2565. (*Chairman.*) Now, how would you describe your occupation?—Spinner.

2566. You have worked here six years, have you?—Yes

2567. I suppose you had holidays at times?—Sometimes.

2568. How many days were you off last year?—I could not say just.

2569. But you had the regular holidays when the mill closed?—Yes.

2570. Did you go off at any other time excepting on the regular holidays?—No, except when I was sick.

2571. How many days were you sick last year?—There were not very many.

2572. Did you have to go to the doctor?—No.

2573. Have you had a doctor at all since you have been in this mill?—No.

2574. Never been to a doctor, but you were not well and you stopped at home?—Yes.

2575. Do you think the illness you were suffering from was anything to do with your work?—Just a headache or two.

2576. Was your appetite good or bad?—My constitution was down once.

2577. How long did you have to stop away?—About a week or two.

2578. Was that once in the year or more than once?—Just once in the year

2579. How long ago was that? About a year ago now.

2580. Is that the only time in the six years that you have worked here?—Yes.

2581. Only once in the six years you had to go away?—Yes

2582. With your constitution down. You have got a waterproof apron on. Is there a bib to it?—Yes.

2583. Why do not you cover your blouse with it? Why do not you put it up?—There are not many puts them up.

2584. I know that, I can see that, but I want to know why you do not. Tell us why you do not. Is it because you do not think it looks pretty, or what is it?—I do not know—just don't see the rest up and so I don't put mine up

2585. (*Mr Ewart.*) If the others put theirs up, would you have any objection? (*No answer.*)

2586. Did you ever try it up?—No.

2587 (*Chairman.*) Does your blouse get wet sometimes?—Just when you are putting in the rove

2588. When you go home at night, do you take off that blouse and put on another one?—Yes.

2589 (*Professor Petavel.*) Before you leave the mill or when you get home?—When I get home.

2590 (*Chairman.*) Do you go home in that one?—Yes.

2591. All the year round?—Yes.

2592. What do you put over it to keep the cold out in the winter?—I put a blouse over it in the winter time.

2593. Do you put a dry one over the wet one?—Yes.

2594 Would not it be better to take off the wet one altogether and leave it?—It would.

2595 Supposing you were given a comfortable flannel one, would you wear it?—Yes

2596. Take it off when you went away from work, and put it on in the morning?—Yes.

2597 Now supposing somebody said to you, now you can do just what you like; you have to make it comfortable for the spinners, what would you do to make it comfortable? Give them a bigger wage, I expect?—Yes.

2598. When you had done that, what would you do? What would you do to make the room more comfortable?—I do not know.

2599. Is there anything you think you could do to make it more comfortable? We want to know. We want to try and make it more comfortable, if we can, and if anybody can tell us something that is sensible and reasonable, we should like to hear it?—If they would put slop boards on to keep the room dry They were on before, but they were in the road before with the spinners.

2600. Did you work with one?—No, they were not in my room; they were put in the other place.

2601. Have you ever worked with one?—No, I have not worked with any yet.

2602. Do you think you could work with one?—I do not know. It might be in the road.

2603. But you would like to try?—Yes.

The witness withdrew.

M—— A—— G—— called and examined.

2604. (*Chairman.*) How long have you been a spinner?—15 to 22 years.

2605. That is seven years?—Yes.

2606. What sort of health have you enjoyed all that time?—Very best of health.

2607. Ever had to see a doctor?—No.

2608 Never had to see a doctor in the whole seven years?—No.

2609. Of course there is a lot of wet about in the spinning room?—Well, if you watch yourself you will not be wet.

2610. You have an apron on there?—Yes.

2611. That is to keep the wet off?—Yes.

2612. What about the other part of your body?—We are too warm if we keep the bibs up

2613 Supposing you had a flannel blouse or something made like flannel, would you wear that?—They are too warm.

2614. Would it be anything warmer than you have on now?—Indeed it would.

2615. Does your blouse get wet now?—No.

2616. It does not?—No.

2617. When you go home do you go home in that blouse or another?—I live close to. Anybody that lives near does not change their clothes at night.

2618. How far have you to go?—Five minutes.

2619. Do you put something over you to keep you warm?—A shawl

2620. Do you think there is any kind of protection that could be made that you would wear?—I do not think so. We are far better off as we are.

2621. That is, to wear your own clothes?—Yes.

2622. What about splash-boards, have you ever used one?—Yes, they are awful in the way.

2623. Tell us why they are in the way?—You cannot get so near the flyers with the splash-boards on.

2624. Does it interfere with you when you are piecing?—Certainly it does; they are awful in the way when you are piecing.

2625. Do you do any laying on?—They would not be much in the way then, but when you are piecing up they are in the way.

2626 What about the heat of the room. Do you feel the room too hot or too cold?—The room is all right. I cannot say much about the room.

2627. The room is all right?—Yes.

2628. Now supposing somebody said to you, "You " can do just what you like to make it comfortable for " the spinners in that room where you work," could you suggest anything to make it more comfortable?—No, we are quite comfortable in the spinning room.

2629. And if anybody came to you and said now you can just do what you like, you could not suggest anything better?—No.

2630. Not even better money?—We are far better single than married.

2631. Oh, I didn't say that! I said money, not married. Of course, that is another question. I will not ask you about that; I am too shy. But about money You would like a bit more money, I expect?—We cannot complain about what pay we are having or anything like that.

2632. (*Chairman.*) I congratulate you. You are contented!

The witness withdrew.

SEVENTH DAY.

Saturday, the 26th day of October 1912.

At Belfast and Lurgan.

PRESENT

COMMANDER SIR HAMILTON FREER-SMITH, R.N., C.S.I. (*Chairman*).

Mr. HENRY CUMMINS.
Mr. HERBERT EWART.
Professor J. E. PETAVEL, F.R.S.
Professor LORRAIN SMITH, F.R.S.
Mr. D. R. WILSON (*Secretary*).

Miss HILDA MARTINDALE, called and examined.

2633. (*Chairman.*) You are H.M. Senior Lady Inspector of Factories?—Yes.

2634. Where are you stationed now?—I am in Birmingham as Senior Lady Inspector for the Midland Division.

2635. For some time you were in this part of the world officially?—Yes, I was senior Inspector here for three and a half years from September 1908, and also before that I had inspected here.

2636. I see you have been good enough to prepare certain notes, and I and the other members propose to ask you questions relating to these, but first might I ask you if you have been able to form any general opinion as to the health of the workers employed in spinning and weaving rooms from your personal observation and your interviews and inquiries with the workers?—Well, they certainly look to me not a well nourished set of workers.

2637. How would you compare them with the Lancashire weavers?—I am afraid I have no experience of the Lancashire weavers. I have never visited in Lancashire.

2638. Do you think the question of nourishment or housing affects their health in any way?—I think the housing is good in Belfast. In nearly every case a family has a separate house.

2639. Would the nourishment question depend on the wages earned?—Yes.

2640. Do you think the wages are sufficient to give them ample nourishment?—The wages seem to me low, certainly, and in addition the bonus is generally included in the wages, and they lose their bonus so easily that I always think that this is a matter which ought to be considered in reckoning wages.

2641. Is the bonus lost for non-attendance?—Yes.

2642. Not regular attendance?—Yes. In some cases I have found the bonus is a shilling a week. If a worker were late and therefore shut out of the mill she might lose either half her bonus or the whole bonus. The most severe case I came across was where the bonus was 2s. and that was lost entirely when the worker was late one morning.

2643. One may perhaps assume that the amount of effort made by the individual worker will depend very much on the home necessities. I mean supposing that a girl had a father who was earning good wages and that there were several bringing in money to the home, it would not be necessary for her to exert herself in the same way as if the home depended upon her?—No, that is so.

2644. The more poverty, the harder a weaver will have to work to get a wage?—Yes.

2645. (*Mr. Ewart.*) Might I ask if that case you mentioned of a bonus of 2s. being stopped for one miss, as it is called, is known to you?—Yes.

2646. Legally known to you?—Yes, I investigated that case and took it into Court.

2647. You took that case from the books of the firm who were said to give 2s.?—Yes.

2648. From the books of the firm?—Yes. It was admitted and we took the case into Court.

2649. Admitted by——?—By the employer. It was not in Belfast. It was in a country mill, and the spinners told me they had a 10s. wage, and then when we came to inquire we found the wage was 8s. and the bonus 2s. It was a case that went finally to the High Court.

2650. (*Chairman.*) I find your first remarks relate to ventilation. Would you be good enough just in your own words to make any suggestions on that point?—It would seem that the regulation with respect to ventilation is a very useful one. It has been very helpful in investigating complaints about ventilation to have some sort of standard to go by.

2651. That is the CO_2 standard?—Yes, the CO_2 standard.

2652. You have expressed some opinion in regard to the methods of lighting: what do you think would be the best?—I feel very strongly that electric light for weaving sheds is certainly a great improvement. I was in a factory only the other day where the employer told me that before putting in electric light they often had five or six girls faint in the evening, but now it never occurred.

2653. Have you seen factories where they have a high-pressure gas system, such as the Selas and the Keith Blackman?—Yes.

2654. Have you noticed the effect of those at all?—No, not particularly.

2655. (*Mr. Ewart.*) Might I ask does this question about ventilation refer to factories, weaving sheds, or to mills?—Well, of course the same standard is laid down for both spinning mills and weaving factories.

2656. But are there any factories that are not mechanically ventilated?—I should think most of them are thus ventilated now.

2657. Is there not a Home Office Regulation that there must be a certain number of fans of a certain minimum size?—No, the regulation only requires that the amount of CO_2 shall not exceed a certain limit.

2658. I mean a very much older Regulation than that.

2659. (*Chairman.*) That was repealed.

2660. (*Mr. Ewart.*) I think most factories put them in.

2661. (*Chairman.*) But now the standard is not the number of fans, but the amount of CO_2. I mean to say the law as it at present stands requires a CO_2 standard, and you do exactly as you like as long as you maintain the standard.

2662. (*Professor Lorrain Smith.*) But the standard is maintained?—Yes, I find it is maintained very often. The one case I have given in my notes was a case where the weaving shed was lit by gas jets. I visited this place on complaint that the room was exceedingly hot, and I found that the temperature was 79° and the amount of CO_2 was 39·2 volumes in 10,000. I found this result useful, because it made obvious that further ventilation was required, and that, of course, would also reduce the temperature.

2663. Was it dry bulb, 79°?—It was 79° dry bulb.

2664. (*Chairman.*) Of course, what you point out (that you actually found 39·2 volumes of CO_2) is a strong argument in favour of electric light?—Yes.

2665. And presumably, if you have the electric light, the daylight standard might be maintained?—Yes. In the above case 1,200 gas jets were in use.

2666. Next, exhaust ventilation. The first part of this Regulation 2 refers to dust processes?—Yes.

2667. Practically, the whole of the Regulation applies to dust processes?—Yes.

2668. This Regulation is not strictly within our Reference, but, I think, we should be glad to hear from you whether you think that the question of dust exhaustion and ventilation in these rooms is satisfactory, and whether any progress has been made in late years?—I think a great deal has been done in late years to instal good exhaust ventilation in these rooms, and it has been very much appreciated by the workers. The workers in several cases have spoken to me about it, saying how much they have appreciated it. They used the expression that "they go home quite fresh now."

2669. I want to place that on record, because sometimes it has been said there has been negligence in the administration of the Act in these parts, and I am glad to hear what you say on this matter?—Yes, certainly a good deal has been done in the carding and preparing rooms, which are the rooms I should inspect.

2670. The roughing and sorting rooms you would not go into, perhaps?—No, I should not go into those, because only men are employed there.

2671. I will now read Regulation 3 of the Flax Regulations:—*In every room in which hand-hackling, roughing, sorting, machine-hackling, carding, or preparing is carried on, an accurate thermometer shall be kept affixed; and the arrangements shall be such that the temperature of the room shall not at any time during working hours where hand-hackling, roughing, or machine-hackling is carried on, fall below 50 degrees, or where sorting, carding, or preparing is carried on, below 55 degrees.* What would you like to say on that point?—I found a good deal of irregularity with regard to the temperature in carding and preparing rooms. Out of 12 mills visited in November and December 1910 eight were found to be infringing this Regulation. The temperature in one case was as low as 11 degrees below the minimum.

2672. Below 55°?—Below 55°. It seems to me that 55° is a reasonable temperature, but that it should be secured before the expiration of one half-hour after the beginning of the period of employment. Now, of course, one does not have to require that temperature should be secured until one hour after beginning work. I think it should be one half hour. Also, I think that great care will have to be taken now, because with the exhaust ventilation I found that some of the rooms are very cold. Good means of heating will have to be installed in these rooms. In some cases I have found they let in heated air, and I think that method has been very beneficial.

2673. Now the hygrometers. You are of opinion that the hygrometers are not maintained satisfactorily?—Well, I have found cases in which the wet bulb has been allowed to become quite dry.

2674. Have you read the Recommendations made by the late Committee on Cotton Weaving Sheds in regard to the standard of hygrometers and maintenance of efficiency?—Yes, and also those with regard to the recording.

2675. And also the recording. I was coming to recording, but first with regard to the standardising and to the maintenance: would you suggest embodying in our Report the same recommendations for hygrometers, or would you suggest any other method?—It seems to me that the Committee's suggestions would meet the case.

2676. That the recommendations of that Committee would meet the case?—Yes, that there should be something definite in regard to hygrometers.

2677. Now in regard to recording. We are of opinion that it is a waste of time to keep on reporting day after day, week after week, and year after year, that there has been no infringement of the law. All these papers have to go first through the Factory Office, then to the Factory Inspector's Office, then to the Home Office, and then to the Statistical Office to be handled by them, the numbers amounting to something extraordinary. The point is whether that is not rather a waste of labour, and whether it would not be better simply to have a Register book and to record when there was any irregularity, that irregularity to be reported, but not to report simply saying everything is right, everything is right—that there is nothing to report, in other words. Would you make any suggestion in regard to that?—I am doubtful whether such a plan would really answer here. I should be very doubtful as to whether the infringements would be admitted. I do not place very much reliance on recording at all.

2678. You say that the infringements would not be admitted; but are they admitted now?—No, I do not think they are.

2679. Then there appears to be very little use in the records?—No, I do not think there really is much use. The checking of hygrometers can only be done satisfactorily by inspection, I think.

2680. But you see, take it at the best the visit of the Inspector will not be perhaps more than once or twice in the year?—No, one must rely also on the workers gradually noticing the hygrometers.

2681. I take it there are factories that have not been inspected within one or two years?—Yes.

2682. Then you say we must rely upon the workers; but in Lancashire we suggested, in order that the workers may have confidence in the readings, that they should be taken jointly by some representative of the workers and a representative of the manufacturers: in other words, that a little responsibility should be put on the workers. What do you think of such a proposal as that?—Well, it seems to me the representative of the workers here in Ireland would just be the spinning master or foreman. I do not think that the workers are quite sufficiently educated to be able to choose their own unbiassed representative.

2683. You say, "I am somewhat doubtful as to "whether much reliance can be placed on the humidity "records, and I do not think they are checked by the "workers, who are often not in a position to under- "stand the readings." Now I gather from that that you think it desirable they should be checked by the workers?—Yes, I think they should, if they will do so and can really understand how to take the readings.

2684. Or do you think the workers are sufficiently intelligent, with a little instruction, to be able to read a thermometer?—Well, it would take a little time, I think, to instruct them. Certainly at present they do not understand the hygrometers and can very seldom even tell me where they are affixed.

2685. What one would like to do is to educate them up to a point where they can accept a little of the responsibility, and where it could not be perpetually said, as it is now—I do not say justly—that false records are being sent in. If they make those statements, a little responsibility should be put upon them to take them themselves?—Yes, but now they should be able to check the records better than by the system under the Cotton Regulations, where they are registered in a book, because then the workers would never see them, would they?

2686. It is hanging up in the shed: they have only to look when they like?—I see; I did not realise that the register would be kept in the shed.

2687. There is nothing to prevent it. The only difference is that now in the cotton weaving sheds the workers share the responsibility with the employers, and if (as happily we do not often hear) anyone says the employer has sent in records that are not to be relied upon, the representative of the operatives is there to say, "I signed my name to this, and I am jointly responsible for this"?—Yes.

2688. I have put before you methods that we have recommended, but can you suggest anything apart from that that would make the readings a little more reliable?—No, I am afraid I cannot. It must simply depend on more inspection, I think.

2689. That would mean a very large addition to the inspecting staff, would it not? I mean to secure, say, a quarterly visit?—Yes, but there would be certain factories that probably one would have to watch more carefully than others.

2690. We now come to the questions of humidity and temperature, which are really the principal ones before us. On the question of temperature in the spinning rooms, have you any suggestion to make? You are of opinion that the temperature is excessive: could you make any suggestions in regard to the reduction of the temperature?—How it should be brought about, you mean?

2691. Yes?—Well, that comes further on in my evidence. It seems to me that much can be done by the use of splash-boards. With splash-boards the floors are kept much dryer, with the result that the humidity is much less in spinning rooms.

2692. I think we might deal with the question of temperature first, then we shall come to the humidity afterwards?—Yes

2693. In regard to the temperature?—In spinning room, it seems to me, that the temperature can only be reduced by more ventilation

2694. Have you gone into the question at all from a manufacturing point of view as to what temperature is necessary?—No, I am afraid I have not

2695. Of course, it is very technical. I wanted to know whether you had sought advice on that point, as to what is really necessary from a manufacturing point of view?—No. I find it very difficult to form an opinion, because for different kinds of yarn they want such different temperatures. May I say the tables that I have put before you were the result of special visits. I took these figures down when I was visiting these particular places on complaint. I had 42 complaints regarding high temperature and want of ventilation or excessive humidity, during January 1909 to June 1912. There were 42 complaints altogether, and these were of factories often complained of, and during my visits I took down these records. These are the kind of temperatures that workers complain of.

2696. (*Professor Petavel.*) Were these temperatures taken by yourself or copied from the record?—Copied from the record.

2697. (*Chairman.*) Have you had complaints from the workers in regard to any discomfort or ill-health said to be due to excessive moisture or heat?—Yes, I have had complaints about the discomfort. The mother of three girls employed in one shed spoke to me very strongly about the matter and said in her opinion this particular shed should be condemned, it was so warm. She told me on warm summer days her daughters came home in a thoroughly exhausted condition, with their clothes wet through. Another worker who also lived close to this factory told me that she had left this factory to go and work in another where the conditions were better, and although this other factory was two or three miles away from where she lived she did not come back in nearly such an exhausted condition as she had previously when she worked in this factory which was quite close to her home.

2698. I think there will be no harm—of course it is not for publication—if we could ask Miss Martindale to give us the name of this factory.

2699. (*Mr. Ewart.*) I go back to a conversation we had on the first day, that I think without such information we do away with a great deal of valuable inquiry.—It was——

2700. (*Mr. Ewart.*) Might I ask, do you know what factory that weaver went to in preference to——? Were they making the same class of goods?—She went to————.

2701. You do not happen to know that goods differ?—I know they differ. I am afraid I do not know the technical difference

2702. (*Chairman.*) You know, of course, that in the spinning rooms there is a very large amount of moisture and damp?—Yes

2703. Can you suggest any better methods than exist at present, in the first place? I am not talking of wetting the workers, but I am now talking of reducing the amount of heat and moisture in the spinning room?—No, except by ventilation, and also I understood that when the floors are kept dry it makes a tremendous difference in the humidity of the room.

2704. Because there is a smaller evaporating surface?—Yes. Also it seems to me that the temperature of the water in the spinning troughs is sometimes kept unnecessarily high. In some factories, I understand, it is left to the spinners to turn on the steam for heating the water, and I found a great difference in the temperature of the water used for the same kind of yarn.

2705. Have you generally found the steam pipes to be satisfactorily covered?—Yes, I have. I have not found any irregularity with regard to that

2706. Can you say generally whether efficient means are taken to confine the steam in the troughs?—Yes, on the whole I think they are, though it does seem to me sometimes the water is allowed to get far hotter than it need be.

2707. Now, of course, the workers are liable to have a considerable amount of spray thrown on them from the flyers?—Yes

2708. And they walk about on wet floors. Can you suggest any method for reducing the amount of wet that finds its way on the the clothing of the workers?—I think splash-guards should be fitted on all frames of 2-inch pitch and over. There is such a tremendous improvement in the rooms where these have been in use.

2709. Now, on this question of splash-guards. You may know, or do you know, that the question has been frequently considered?—Yes.

2710. Have you heard that the workers make objection to them on certain grounds, one being the difficulty of piecing and laying on?—Yes, I understand they object to them to begin with, but their objections seem to wear away. I have spoken to a great number of the workers employed on the spinning frames where splash-boards have been fitted, and they do not complain at all. They say they do not get in their way when they have once become accustomed to them. The only case in which I received a complaint is where a very clumsy form of splash-board is used with a treadle action which is very heavy. It is difficult to clean such spinning frames, but I have only found this particular frame in one mill. I have found a very good form of splash-guard in others

2711. Where they are used, do you think they conduce to the comfort, and possibly the health, of the workers?—I am certain they do.

2712. The floors are less wet?—Yes, far less wet

2713. And of course there will be less evaporation of moisture?—Yes.

2714. The girls work in bare feet?—Yes, they do.

2715. Now, seeing that they do work in bare feet, does it matter very much from the health point of view whether the floor is practically saturated or whether it is only moist? We have already considered the question of evaporation, but I mean from the physiological point of view?—I am afraid it is difficult to reply to that

2716. It is a little difficult to answer that?—Yes

2717. I ask it because so many people going into a spinning room will say, "This is something terrible; there are puddles here." Well, one would very much rather not see it, but you also have to consider whether the puddle is very much more injurious than the damp floor. We have to consider it from both sides?—Yes.

2718. Do you think that as spinning rooms are now constructed there might be difficulty from want of space between the frames in putting splash-boards on?—I suppose in a few it would be so. It would mean moving out a spinning frame in some places, but not in all.

2719. In a good many it would mean reconstruction of the spinning rooms?—I should think in some it might, but not in a great many.

2720. You know the present regulation, of course?—Yes

2721. That there must be waterproof aprons, and that there must be bibs of suitable material?—Yes.

2722. As a matter of fact, is that regulation carried out, or is it not carried out?—As far as the bibs are concerned it is not The workers object very much indeed to the bibs

2723. On what ground?—That they are very hot and uncomfortable and difficult to keep up

2724. Can you give any reason for that?—I think myself that the waterproof aprons and bibs are really not suitable for working in, in these hot temperatures.

2725. What would you suggest as an alternative?—I should have the splash-guards certainly, and then canvas aprons as well

2726. We have, of course, come to no decision yet, but supposing that it may be found impracticable in every instance to use splash-guards, what precaution would you suggest by way of an alternative? Well, in the fine spinning I think a really good canvas or sacking apron or skirt with a bib would be sufficient.

2727 With a bib?—Certainly with a bib for the doffers, for the girls. The women do not seem to get so wet above the waist. I think the spray seems to catch them much more below the waist.

2728 That is for the fine spinners?—Yes.

2729. What would you suggest for the coarse spinners?—Of course I feel the one thing is really splash-guards

2730. As I said before, supposing we cannot get them in every case?—I should still keep to the sacking but with quite a small piece of waterproof apron in front, and no bib.

2731. Is that on the ground that it would be absorbent and allow free perspiration?—The sacking you mean?

2732 Yes?—Yes. I have seen it in use in some places and the workers are quite dry.

2733. Would you insist that there should be one or, say, two or even three suits for each worker, which should be taken off before leaving the works?—Yes, and that they should be provided, of course, by the employer, and that they should be washed and dried at the factory.

2734 Coming back to the bib, the law at present says that it shall be of suitable material?—Yes.

2735. I put it as a question to you. What I want to ask is, can you suggest any clothing for the protection not only of the body—I mean to say, the lower part of the body—but of the breast, that would be efficient and would be worn by the workers? I put this because I think this is so very much a question that ladies could form an opinion about better than the average man?—Yes, I think the sacking bib would do that and would be quite comfortable to wear, and I do not think the workers would have any objection to it. As I have said they cannot keep up waterproof bibs, but they could quite easily pin up those made of sacking, and they would be quite comfortable.

2736. Now as to the clothing of the workers, have you any suggestion to make in regard to hanging up the clothing?—The cloak rooms?

2737. Well, yes, cloak room or any other thing that suggests itself to you. The law requires cloak rooms in places that were erected after a certain time?—Yes.

2738. But we have a large number of places where not only does the law not require it, but it would be difficult to find the space?—Yes

2739 Now in such places what would you suggest?—I am afraid I do not know. I have seen a great number of boxes either on the window-ledges or underneath the frames, and I do not think they are at all satisfactory.

2740. Have you noticed in the spinning rooms, in very many the wall is absolutely damp?—Yes, it is.

2741. And have you noticed in such places the clothing is frequently hanging on the damp walls?—Yes; but the boxes are as unsatisfactory, for on a wet day when the workers come in damp their clothes are just folded up and put into the boxes, and they are just as damp when the workers leave.

2742. Of course that is on a damp or wet day?—Yes.

2743. Those are proportionately few in the year, but what I ask is, supposing you had partitions with some waterproofing at the back and a cover to prevent the damp coming through—whether that would improve the state of things?—Well, it might. Of course you have seen these made by "Crittal"—something of this sort might be put where there is space.

2744 (*Secretary*) We saw those at——

2745. (*Professor Petavel.*) Is there room for them in the spinning room?—In some there might be. In others probably there would not. But there might be something similar made on a smaller scale.

2746. Then coming to the weaving sheds. You suggest seats for weavers, and spinners?—Yes, I think that is most important.

2747 I think that most people will, if they consult their own feelings, entirely agree with you; but do you think it is practicable? I mean, do you think that where seats are provided the weaver could do her work and, at the same time, rest from time to time?—Well, one finds that they have been provided in one or two factories. In Mr. Ewart's factory they are provided, and they are much appreciated. I have known workers leave other factories to go to a factory where they could have a seat.

2748. We have not yet seen them. We might possibly take an opportunity of seeing them?—I am sure they appreciate the provision of seats. They have told me so time after time. If they can just sit even for a few minutes every now and then it makes such a difference to them.

2749. You make a suggestion in regard to a supply of drinking water?—Yes. I have had a certain number of complaints regarding factories where drinking water has not been provided. The workers seem to feel greatly the need of it

2750. There is no provision under the present law which would allow us to enforce that, I think?—No, I do not think there is.

2751 There would have to be special legislation for it, I think?—Yes.

2752 No doubt it would be very desirable?—It certainly is most desirable. They certainly need it.

2753. Then in regard to the weaving sheds, have you anything to say in regard to the temperature?—I have found excessive temperature in some of them, and the workers I find more inclined to complain about the excessive temperature in weaving sheds than they are in spinning rooms.

2754. To what do you attribute that?—I think probably it is that in the weaving sheds they are more warmly clad and of course the temperature is very excessive.

2755. Would it be also due to the fact that in the weaving sheds there is more moisture?—Yes, and they are more difficult to ventilate very often.

2756 I mean there is less difference between the dry and wet bulb temperature?—Yes, that is so.

2757 So they would be exposed to conditions more nearly approaching saturation?—Yes.

2758. I ask you the question—I know it is very technical—have you gone into the question at all as to taking any advice on the amount of humidity necessary for weaving?—No, I have not been able to form any opinion. I have asked employers periodically, but I have not really been able to form any opinion on that matter.

2759. In regard to the question of the purity of water for humidifying, I notice you have no complaints?—No, I have not had any complaints at all about that.

2760. There is a regulation in force, of course?—There is, but I have not had any complaints. For the sake of some country factories I think it might be very useful to keep the regulation

2761 The question of steam pipes we have already gone into, and also into the question of preventing the escape of steam?—Yes.

2762. And with regard to splash-guards, I think we cannot say much more on that point at present?—No.

2763. We have not gone very much into the question of floors in spinning rooms, but can you give any suggestion for keeping them dryer?—I think the most important thing is to have them well arched. Many of the floors are very good in the spinning rooms here. I have seen some very good ones.

2764. The cloak room question we have gone into, and the question of respirators. You think it is a useless regulation?—I do, yes.

2765. I mean that they will not work?—No.

2766. Of course, that was recognised when those regulations were drawn up. I may point out, but it was thought that if there were some clean ones supplied, they might be worn just for the moment, although they would not be worn during the whole of the work time, when any specially dusty process was being used for instance, taking a large amount of dusty tow to place in a machine?—Yes, but of course with the exhaust ventilation that has been installed respirators are really unnecessary now.

2767. (*Professor Lorrain Smith.*) I am not very clear about your answers regarding the extent of the complaints you have had. You mentioned two or three cases, but you did not give any general statement of the extent to which the workers complain of the conditions?—Well, from January 1909 to June 1912, I received 42 complaints regarding high temperature and want of ventilation or excessive humidity in flax spinning and weaving factories, and also in those 42 are included the complaints of wet floors. They very often complain to me about the wet floors in the weaving sheds.

2768. (*Mr. Ewart.*) In the weaving sheds?—Yes. There is a good deal of moisture due to the water condensing on the cold ceilings and dropping on to the ground. I have seen quite a number of wet places due to this. Some of these complaints stated that the roof was not in a good condition, and when I came to inquire into it I found that the wet was merely due to the steam condensing on the ceilings.

2769. (*Chairman.*) Yes, we have seen that.

2770. (*Professor Lorrain Smith.*) Was that more in summer than in winter? Did you notice the time of the year?—It was more in the winter.

2771. Those 42 were not specially in summer?—No, they were not specially in summer. They were during that period from January 1909 to June 1912; and they extended right over that time.

2772. These are definite complaints that were brought to your notice?—Yes.

2773. But generally, apart from definite complaints, do you think they suffer much discontent?—I do not think they complain very much. I think that is a great deal because they begin so young. The children go into the mills at twelve, and they get accustomed to the conditions. One employer said to me he thought he would find it very difficult to get workers if they could not employ children of twelve. They would find it difficult to get workers to go into the mill at fifteen or sixteen; they would not like the conditions; but when children go in they get accustomed to it and do not think anything more of it and work straight on.

2774. (*Professor Petavel.*) That, I think, is an important point. I should like to hear from you, can you fix any temperature above which complaints are usually received, either from a weaving or spinning room?—I think that the following tables which I hand in show the temperatures that workers complain about.

TEMPERATURES RECORDED IN FACTORIES REGARDING WHICH COMPLAINTS WERE RECEIVED.

A.—*Spinning Room. June* 1910.

Morning.		Afternoon.	
Dry.	Wet.	Dry.	Wet.
86	80	83	74
86	81	87	82
88	84	88	82
87	82	—	—
84	79	82	75
86	81	88	82
87	81	87	81
88	83	88	80
83	78	87	80
88	84	-	—
86	80	87	80
87	81	88	82

B.—*Weaving Shed. June* 1910.

Morning.		Afternoon.		Outside Temperature (11 a.m.)
Dry.	Wet.	Dry.	Wet.	
77	74	81	77	60
77	74	80	77	62
78	75	74	75	64
76	73	-	—	59
77	74	81	77	59
80	76	85	80	61
84	78	85	81	67
81	77	85	81	67
84	79	88	82	69
83	72	—	—	67
77	72	80	75	63
78	73	82	78	64
80	77	82	78	64
82	78	85	80	70
83	78	85	80	67
84	80		-	71
80	77	81	79	69
80	77	83	78	71
78	75	81	77	61
80	77	83	78	67
76	73	78	75	59
79	76	-	-	61

C.—*Weaving Shed. June* 1910.

Date.	Morning.		Afternoon.		Outside Temperature (11 a.m.)
	Dry.	Wet.	Dry.	Wet.	
6th	72·0	69·5	79·0	75·0	59
7th	76·0	72·5	83·0	78·0	61
8th	79·5	76·5	83·5	80·0	67
9th	81·0	78·8	85·5	84·5	67
10th	81·5	78·0	85·5	79·5	69
11th	80·0	77·0	-	-	67
13th	76·0	73·0	—	—	63

D.—*Weaving Shed. August* 1910.

Date.	Morning.		Afternoon.	
	Dry.	Wet.	Dry.	Wet.
8th	79	77	87	84
9th	83	80	88	85
10th	82	79	89	86
11th	82	78	88	85
12th	83	79	88	82

2775 You have not formed any opinion as to whether the temperature at which complaints are made is lower in the weaving shed than in the spinning mill, or the reverse?—No, I do not think I can reply to that.

2776. You alluded to the fact that the worker became accustomed to a high temperature through long work in the shed?—Yes.

2777. And that therefore, I understood you to say, the temperature at which discomfort was felt was probably higher for that class of worker than for another. Could you give any indication of what difference there is between the two classes of the population?—In what way do you mean particularly? Between the spinners and the weavers?

2778. Between spinners and weavers and other workers in other factories?—I think the spinners are certainly the poorest class by far

2779. No, that is not quite the point. Do you think that they can, without suffering, stand a higher temperature than another class of the industrial population?—Yes, I should think they probably could, because they have got so accustomed to it they do not think of it; they have accustomed themselves to it.

2780. But you have not formed any idea as to the difference in temperature?—No.

2781 (*Professor Lorrain Smith*) Or what they can accustom themselves to?—No, I have not. I have always noticed that the temperatures I have given here are the kind of ones they have complained about. They have not generally complained when it has been less than that.

2782. Roughly when the wet bulb is over 80°?—Yes, roughly that would be it. I do not think they complain very much when it is below.

2783. To pursue this point a bit further, you say they get accustomed to it and do not feel the discomfort. Do you think the same applies to their health—that the body gets accustomed to it and does not suffer in health?—That is rather a medical question

2784. But just your general impression of it as an observer?—Yes, I should think they do

2785. You did not mention so many cases of exhaustion to such an extent as one would expect?—No, I did not have so many as one would expect. They have complained, but not to any very great extent.

2786. You could not say that this type of occupation really is causing a deterioration in health amongst these people?—I am not really in a position to reply to that.

2787. And as regards dampness, you have not noticed that the damp clothing which they suffer from can be directly shown to cause ill-health?—No.

2788. Say colds or bronchitis or any of the things one gets from exposure?—I have never had any complaints to that effect.

2789. (*Professor Petavel*) Do the complaints you receive seem to indicate that there are a certain number of factories excessively hot, or that all the factories are occasionally excessively hot?—No, I think that the complaints show that there are certain factories much hotter than others. There are certain places I have never had a complaint about, and there are other ones that have been complained about incessantly.

The witness withdrew.

Mr. William Williams, called and examined.

2790. (*Chairman.*) You are one of His Majesty's Superintendent Inspectors of Factories?—Yes, just recently appointed to that position.

2791. Your jurisdiction extends over Scotland and Ireland?—Scotland and Ulster.

2792. Formerly you served in various districts?—Yes. I started specially under the Cotton Cloth Factories Act in 1892 in Lancashire, and stayed there for many years simply inspecting humid textile factories, mainly cotton cloth factories. Then in 1906 I was transferred to Belfast, and served here for two years.

2793. You were, I think, Secretary to the Roscoe Committee on Humidity and Ventilation?—That is so.

2794. And as Secretary of that Committee, and, subsequently as Inspector to supervise the provisions of the Cotton Cloth Act, you had ample opportunities of being acquainted with all regulations relating to humidity?—Yes, I was closely in touch with them, of course.

2795. You were also, probably, from your own observation and from interviews with operatives, able to form some opinion as to the views held by operatives in regard to humidity?—Yes, I was in fairly close touch with workers in Lancashire.

2796. Will you tell the Committee what views, as far as you know, were held by the operatives in Lancashire in regard to the question of artificial humidity?—Well, there is no question that in Lancashire the weavers as a body are very strongly opposed to the infusion of artificial moisture in the weaving sheds.

2797. On what grounds?—They believe that it is injurious to health.

2798. How would the abolition of artificial humidity affect the weaving?—There is no question that with many classes of weaving, even with cotton, the abolition of artificial moisture would be a serious handicap in carrying on the business. It might even go so far as to render it almost impossible successfully to weave certain classes of cloth.

2799. Would the abolition of artificial humidity make the work harder for the weaver?—Oh, undoubtedly. More ends would break, and therefore the weaver would have to work harder to keep up the work, and as a consequence the wages, being piece-work, would be lower.

2800. I was going to say, how would it affect the wages?—Inasmuch as it would break the ends—the thread of the warp—it would necessarily reduce the output of the weaver, because the loom would have to stand for the repair.

2801. Of course you have read the Report of the late Committee on Humidity and Ventilation?—Very closely indeed.

2802 Should you consider that in view of the information obtained and the evidence taken that it was necessary to hold a similar inquiry in Ireland?—I think it ought to do good. I think the information obtained by the Committee in cotton must necessarily be of some service here.

2803. Do you think that from a health point of view there is any wide difference between a cotton cloth factory and a weaving shed or spinning room in Ireland?—As regards the weaving sheds, the comparison may be made a little more directly than for spinning. I have no evidence that would warrant me in thinking that the health conditions in linen weaving are worse than for cotton, and there is one consideration that might even make them somewhat better. I think as a rule the temperatures in linen weaving, in summer at any rate, are lower than in cotton, because, according to my experience, the average temperatures in summer are as a rule lower in Belfast than in Lancashire.

2804. And what about the humidity?—In many sheds in Belfast, the relative humidity is distinctly higher than is reached in cotton weaving or than is allowed in cotton weaving.

2805. (*Mr. Ewart*) That is at the higher temperatures?—Yes, at anything over 70° you get a difference in the scales for cotton and linen with a dry bulb over 70°.

2806. (*Chairman.*) Now taking the spinning rooms first, have you given any attention to the temperatures reached?—Yes, I did years ago, of course; five years ago when I was here as district inspector. The new regulations, I may say, only came into force a little before I left here; they were not in force the whole time; but even before they came into force careful inquiries were made; and in point of fact I sent out a circular on the 30th of May 1907—that was shortly after the regulations came into force—to all the master spinners in Ulster calling their attention to the requirements of the regulations and suggesting in some cases means by which the requirements might be met. I have looked that up. I have a copy of the circular here.

2807. We are now taking the spinning rooms?—Simply as regards the spinning rooms.

2808. To your knowledge are very high temperatures reached in the spinning rooms?—Yes, you certainly get high temperatures.

2809. You are of course aware that various precautions are now taken to reduce it?—Yes.

2810. Such, for instance, as the covering of the pipes and the prevention of escape of steam from troughs?—Yes.

2811. And certain methods of ventilation, and so on. Can you suggest any means by which the temperature could be reduced in spinning rooms?—Yes, I think there are certain suggestions that might be made. In my notes of evidence I have followed the regulations. The heat was in some cases unduly raised first of all by perhaps inefficient covering of the pipes: the pipe covering itself was not always efficient in quality, and in some cases the whole length required by the regulations is not covered. One saw instances of that. The attention paid to that point, perhaps, was not as close as it might have been. Probably, it is only a matter of calling the attention of the master spinner to it to get that done. There is a further point. The practice is certainly growing, in spinning, of introducing water into the troughs warmed, in some cases even hot. The regulations do not require that the pipes conveying that water—which, as I say, frequently is warm and even hot—should be protected in any way, or insulated for the heat, although heat is thrown off from those pipes. That is as regards direct radiation of heat. Moreover, the control of the heat in the troughs themselves is more or less spasmodic; it is certainly not very thorough in some cases. This week I have been making observations on that point, testing temperatures of water on counts which are in the same room—the same counts, the same class of work in every respect—where the manager would like, if he could get it, absolute uniformity of temperature of the water; and I found very considerable variations of temperature. For instance, I will give one which will illustrate the point. In one room (which I may say I visited because I found from the records that it was high in temperature) there was one frame spinning a particular class of counts where the water was 153°. Now I went to another frame, spinning exactly the same class of counts, and the water there was 172°, 19 degrees higher. Yet another I went to at 185°—still spinning the same counts. There you see there was a difference of 32 degrees between the temperature of the water in the troughs. Now it is quite clear that if the first temperature of 153° was sufficient for the spinning of that particular class of goods it was unnecessary to get the other frame up to 185°.

2812. (*Professor Lorrain Smith.*) The same yarn, I suppose?—Precisely; and the manager himself said they ought all to be the same temperature.

2813. (*Mr. Ewart.*) You speak of the same leas?—The same counts.

2814. But it was the same quality?—Yes, I asked the manager that in particular. In fact, as I say, if he could have secured it, he would have had them all the same temperature.

2815. (*Chairman.*) We are still on the point of the temperature in spinning rooms. Have you any further suggestions to make in regard to rendering it possible to lower the temperature in hot weather?—Well, of course, I think those points I have mentioned deal with the points of prevention of the throwing off of heat. The only other suggestion I can make for keeping the temperature down is carrying off the heat that is produced. The only suggestion I am prepared to make on that point is that the means of ventilation in hot weather should be very much strengthened.

2816. You say carrying off. Do you think the plenum ventilation properly distributed might do something?—It would certainly do something, but I think the same end could be secured more cheaply by the opposite method of exhaust.

2817. Then passing from the question of exhaustion of heat in spinning rooms, we now come to moisture. Can you suggest any method by which the amount of moisture might be reduced?—Yes. There is no doubt that even yet, although there has been a very great improvement, the means of sealing the spinning troughs, that is to say, preventing the escape of steam from spinning troughs, is still in many cases defective. When I was here in 1907, I went to considerable pains about this question of keeping the steam in the troughs. Nobody wants the steam to get out of the trough; the steam costs money, and any escape of steam from the trough, even from that point of view, is waste of steam. The manufacturer does not want it to escape, and incidentally it does increase the moisture of the room, and is therefore bad from the point of view of the worker. To deal with the retention of the steam in the trough, I made a great many inquiries. I was at the subject for some time, and it seemed to me quite clear there was room for improvement in the construction of the troughs, with the view of keeping in the steam. I have here one design, which was brought out partly at my suggestion. (*Blue-print produced.*) That is only one of several ways of dealing with it. You see there the trough has three seals for steam. *There* is the back seal under the creel board; *there* is the movable cover on the trough, and *there* is a third seal—which is not always practicable—at the front of the movable cover. So that if the water is kept up at a proper level (that is another important point) those seals, or dippers, as they are called, would practically seal the trough, and the escape of steam from a trough of that sort—there must be some escape, even then—is reduced pretty well to a minimum.

2818. Will you hand that in?—I shall be very pleased.

2819. Is there anything further in regard to reducing the temperature? Then, of course, whatever means one took to carry off heat, if properly applied—and presumably it would be properly applied—would also carry off humidity too.

2820. Now we come to humidity?—Yes.

2821. Now can you suggest any method for reducing the humidity?—Well, apart from the retention of the steam in the troughs, there is the question of attempting to keep the floors dry. Something could be done by splash-guards, but beyond that I am not sure that I have any suggestion to make as regards the prevention of humidity arising.

2822. Of course, we have formed our opinion, but I should like to have your opinion. You say reduction of the amount of humidity on the floor by splash-guards?—Yes.

2823. In what way would that reduce the humidity in the room?—Well, there would be less surface for the evaporation of water—partly that, and partly, of course, there is a direct humidifying effect of the spray of water being thrown on to the floor; that is being vapourised as it falls.

2824. You suggested splash-guards. Have you, in your experience, heard practical difficulties suggested in regard to the use of them?—Yes, many.

2825. What are they?—The first difficulty—a serious difficulty—is that in some cases in old mills there is not room between the frames to put in a splash-guard. You may take it, I think, that the very minimum amount of space taken up by a splash-guard, as far as I know of any existing splash-guard, would be 12 inches. I cannot recall seeing one under 13; but you may take it at a foot anyway. That would be on both sides the spinners' stand. That means that you are taking out of that stand about two feet of standing room.

2826. (*Professor Petavel.*) That is 12 inches beyond the gables, or beyond the line of spindles?—Beyond the spindle. In a few very old mills they have put in as many frames as they thought practicable in the space, and I am very much afraid in those cases it is almost impracticable to further restrict that space by the two feet necessary for the guards.

2827. (*Chairman.*) Do you think it desirable there should be in the hands of this Committee a return showing the space between the frames in the various mills in the district?—I imagine it would be very helpful indeed.

2828. Then you were telling us about any methods you could suggest for reducing the amount of moisture in spinning rooms?—The only other method I can suggest is the sweeping off, by means of ventilation, of the humidity that is thrown off; and, of course, whatever steps you take to sweep off the heat would carry off humidity too. At present I do not know whether I need trouble the Committee with my views on the point, but the present method of ventilating the rooms, in theory at any rate, seems a little defective. I know there is a reason for it from the manufacturing point of view, but what happens in a spinning room is, the incoming air becomes warm, which lightens it, and it becomes moistened, which also lightens it and the consequence is the currents must tend upwards. In nearly all mills the inlets are at present arranged towards the top of the room, and the consequence is the inlet air has to beat down against a prevailing upward current of air. It seemed to me desirable (though I may say I see difficulties in the way of doing it), to improve the type of exhaust which at present prevails, and secure an inlet somewhat nearer the ground—not right on the ground, but somewhat nearer the floor—so as to get a steady flow inwards, upwards, and outwards. You must have the upward and outward flow on the top, but at present you have not the supply low down, and the consequence is you are somewhat inefficiently battling against the natural tendency upwards.

2829. As to the protection of the workers from wet, can you suggest anything?—Beyond splash-guards I am afraid I can do nothing in the way of suggesting anything.

2830. On the question of clothing? — On the question of keeping outer clothing, the ideal thing it seems to me is the point aimed at in the regulation, of properly-constructed, warmed and ventilated cloak rooms; and for new mills, of course, obviously that ought to be done, and it is required to be done.

2831. And in old mills?—I am afraid I am at my wit's end to make any useful suggestion.

2832. Have you read the suggestions made in the Cotton Cloth Factory Report?—Yes, very carefully.

2833. How does it suggest itself to you for application here?—I am very much afraid there is no old spinning room that I am acquainted with that has sufficient space even in the room itself to give the accommodation which the Committee recommended for Cotton Cloth Factories.

2834. Where do they hang their clothes now?—Anywhere, almost. Frequently they bunch them up in a bundle on the window ledge, or sometimes they hang them on pipes over the frame.

2835. Have you noticed that in many spinning rooms the walls are very damp?—Yes, they are.

2836. Sometimes one sees green on them?—Yes.

2837. Have you noticed clothing hanging up against such places?—I have, yes.

2838. Would not it be better to have some waterproof protection at the back?—The difficulty is that in many of the mills practically the whole of the piers which carry the building are blocked by the end of the frame, so the only place available is the bottom of the window, and in many cases there is not the height to put a peg to enable you to hang a garment on that without it trailing on the floor, because if you put anything higher you obstruct light, of course.

2839. As to the clothing worn at work: can you suggest anything for protecting them at their work?—Only the splash-guards.

2840. Apart from splash-guards? — Apart from splash-guards I think it is very desirable they should have a jute apron—some absorbent material. I think a waterproof skirt, as required by the present Regulation, is oppressive.

2841. What would you suggest in place of the waterproof skirt?—What I should hope for—and, in fact, what I think will have to come even to comply with the present Regulation—would be the general adoption of splash-guards where space did not prevent them, and then a jute apron.

2842. Would you have any protection for the chest?—I do not think that is necessary for the spinner, because she is pretty high up; but for the doffers, the shorter people, I think simply a jute bib would do quite well.

2843. (*Mr. Ewart.*) Before we leave mills, there is a question which was asked Miss Martindale; and I should like to ask Mr. Williams much the same question, but a little more from the observation point of view. Has any observation been made to prove whether there is a difference between a damp floor—simply damp—and a wet floor in affecting the humidity?—Not by me.

2844. Apart from affecting the comfort?—Not by me. No, I certainly have not. One would think, if there were a layer of moisture, even in the form of dew, on the floor, it would be nearly as effective in moistening the air above it as actual water. It might even be more so.

2845. There is another question. Has your attention been drawn to, or have you observed (what is told to me as a fact) that for some reason some of the rooms with the apparently driest floors constantly have a higher relative humidity—the bulbs are closer together?—Certainly my observation would be directly contrary to that, as where the floors are dry, I frequently have been struck by the fact that the air is dry. That is to say, there are some mills here with floors which are practically dry; they may be damp, but as far as one can see they are dry; and certainly in those cases you frequently get a fairly high margin between the wet and dry bulbs. I have not thought about that very closely, but surely it must be so. I suspect that unless the air is moderately dry you could not get a dry floor. Of course at washing times the floor must become wet, and there must be a little spray that misses the splash-guard occasionally. So unless the air is moderately dry it would take a very long time to dry the floor. That is, speaking rather from the theoretical point of view, but practice I am sure would confirm that. I have certainly noticed that some of the mills with dry floors have a drier atmosphere, a less humid atmosphere.

2846. (*Chairman.*) Now, coming to weaving sheds—you probably know and have considered the question of how to reduce temperature in weaving sheds?—Yes, of course, that does come under one's review pretty often; but, as I say, in the two years I was stationed here we had very cool summers, and the high temperatures were not a pressing evil then.

2847. Now, do you think it desirable that some really solid attempt should be made to reduce temperatures in weaving sheds during hot summers and hot days?—I think it is very desirable indeed.

2848.—Can you suggest any methods by which these means could be attained?—As regards humid sheds, there is a suggestion that occurs to me, which is, of course, to secure the humidity by vaporisation of of water in some way or other.

2849. Do you mean by that in preference to steam?—In preference to steam, and also increase the ventilation—make that more thorough.

2850. What about the compulsory white-washing of roofs?—I am not sure that compulsion is necessary here. I think is is generally done without.

2851. But, apart from compulsion, do you think white-washing the roof is efficacious in reducing the temperature?—It certainly helps.

2852. Have you considered the question of double roofs?—Yes, and, of course, that is a very good thing. That I paid some attention to in Lancashire when I was there. As has been pointed out, it is important that the cavity should be properly constructed.

2853. Have you considered the question of spraying the roofs with cold water?—Yes, that was tried in a few sheds in Lancashire, but I was not quite clear that the results were commensurate with the expense of doing it

2854. Have you read the results that were attained by experimental observations in the late Cotton Cloth Committee?—I have.

2855. Have you considered the question of the position of the inlet for air used for ventilation? I mean whether the air should be collected from an inlet close to the roof, or whether it might be collected a good deal higher up, or from some cooler source?—Yes. I thought the suggestions made in the observations of Professor Petavel were unanswerable, except, perhaps, in those cases where the air that is passed through picks up its moisture by vaporisation of water. I am inclined to think, in those cases, the higher temperature you might get from a lower inlet would be neutralised by the effect of vaporisation—at any rate, to some extent; but, generally speaking, I thought the conclusion was unanswerable.

2856. From a health point of view—not talking from a manufacturing point of view—do you consider it desirable that the relative humidity in the shed should be reduced as far as practicable?—Well, I am afraid I have no knowledge that would warrant me in speaking on that.

2857. It would be second-hand knowledge?—Well, it is not even that; it is not knowledge at all I paid a great deal of attention to it in Lancashire, and I have paid some attention to it here; but I am afraid I have no knowledge on the point.

2858. But if you could reduce the temperature of the sheds, would it not be possible to get a relative humidity necessary for weaving at a lower temperature?—Yes, there is no doubt in my mind that if the average linen master-weaver could maintain a temperature of 68° to 70° all the year round he would be delighted to do it—if he could.

2859. Can you point to any methods that have been taken in Ulster to reduce the temperature in weaving sheds?—There are some sheds—I was in one only yesterday looking at their readings for the summer—where very powerful means of ventilation have been put in. For instance, a test was made in September of this year in this particular factory—not by me.

2860. You might tell us the name for our own information?—It is the ——— Factory. A CO_2 test was made in September, and the results in one shed indicated only 6·1 volumes of CO_2 in 10,000, and in the second shed 4·8 volumes in 10,000 only They have three sheds, in all of which there was a powerful system of ventilation. I did not attempt to analyse their readings, but I was glancing at them, and certainly cases of high temperature were not common this year, which could be attributed to a large extent to the powerful ventilation

2861. Now on the question of ventilation (to which no doubt you have given much attention at different times in your official career), would you just state to the Committee any suggestions you would like to make?—Well, it is rather a long story, of course, but I think the first serious suggestion of testing in practice the ventilation of factories by means of chemical analysis was made by the Roscoe Committee, of which I had the honour of being the secretary.

2862. Could you just tell us what the Roscoe Committee say?—They pointed out that the CO_2 must simply be regarded as a measure of the respiratory impurity They emphasised that point in their Report, so that the CO_2 from respiratory impurity should not be confounded with CO_2 which might arise from gas consumption, for example, or from any unusual state of the atmosphere outside.

2863. Impure size?—An extraordinary source, but the main point I think they had in view was the CO_2 from gas or due to an exceptionally high proportion in outside air.

2864. Or you might get CO_2 from any source such as I suggested, from impure size?—Yes, you might, though I should imagine the amount would be very small as a rule.

2865. I think there was a case decided in Lancashire on that point?—I do not know; but I can hardly conceive, after the treatment size receives, that it would throw off much CO_2.

2866. But this was a case of a barrel of impure size in a passage where the air came in And then from the workers there might be a considerable amount of CO_2?—Yes, from the workers.

2867. Apart from the respiration?—Well, I think the amount of CO_2 from the skin is very small The Roscoe Committee did not recommend treating CO_2 as a measure of gas impurity, or any other form of impurity, except respiratory impurity. They recommended a standard of 9, but they believed that it would be unreasonable to expect the management of a mill to make constant CO_2 determinations. On the other hand, it is very undesirable, it seems to me, that we should impose any restrictions on a mill which the mill management is not competent to carry out. That would practically divorce the enforcement of the law from the mill management and throw it wholly on the inspector; and to get over the difficulty their suggestion was this—and I may say the Humidity Committee on Cotton Cloth Factories has suggested a very similar thing for a large portion of the year in cotton cloth factories, and it is embodied in the regulations—their suggestion was this, that firms should be required to put in mechanical means of ventilation which, under ordinary circumstances, will maintain this standard It is quite easily done. Almost any ventilating engineer will guarantee to do that, and having once been passed as sufficient to maintain the required standard there should be a legal requirement that those arrangements should be kept in full and proper operation It is quite a simple thing to do, and how it would work in practice, and how it did work, in fact, in many places, could be illustrated by the very case I quoted to-day, where the CO_2 was so low. They had an apparatus worked by a series of fans, on which was a speed-counter. That is to say, the speed of the fan is indicated by a little instrument So if you find that at a certain speed, these means of ventilation will secure, say, an eight standard, or whatever you like to adopt, then you notify the firm that in future they would have to run the fan at that speed; and if they ran it at that speed and kept the arrangements clean, that would be a compliance with the law.

2868 How about inlets? There would be a good many considerations. The inlets would probably vary from day to day—the opening of windows?—It would not matter, provided the mechanical means of ventilation did control the atmosphere. They should control it.

2869 Supposing, say, in winter, all the windows are closed, and in summer all are open, the results would be very different?—No, in practice it is not: because all weaving sheds have openings at the base of every roof. There is a little opening to let the condensed moisture from the panes of the glass get out, and that space is ample at all times of the year. That opening cannot be closed. That is ample to act in the one case of the plenum system as an outlet, or in the other case of the exhaust as an inlet. That sounds mere theory, but the thing has been tested. There were a series of tests, and the Government spent a considerable sum in proving not only that it could be done, but was done.

2870. It was found a 9-standard could be maintained in Lancashire, but at considerable expense?—Well, it was done, and at an expense which people had gone to voluntarily They had not done it simply for the purpose of supporting the Government.

2871. When you say voluntarily, it was done to comply with the law?—No, to get a better average production.

2872. They put in this ventilating plant to comply with the 9-standard?—Not in all cases. I prepared the list of sheds for the Government tests. The bulk of the firms who were listed had not been asked to improve their ventilation. In some cases the occupiers put these means in, because they knew from experience of other sheds that they get better weaving with them If you thoroughly ventilate a shed with a good conditioning system you frequently get better weaving.

2873 I think we must look at the papers on that subject, because I confess my recollection on the point is rather different to yours?—I was very careful in making my list In nearly every case the firms installed the good ventilation voluntarily, no doubt partly to raise their production

2874. You will remember that there was a very strong protest made by the North East Lancashire Manufacturers against the 9-standard?—Oh, very

2875 That does not go against the theory that they were doing it voluntarily?—No; I think the absolute 9-standard laid down, which had to be maintained notwithstanding what the outside air was——

2876. But is it not a fact that there was a very strong representation made by the North East Lancashire Manufacturers' Association against the 9-standard on the ground of its being unnecessary and difficult to maintain?—Well, I understood their objection—yes, certainly, I think you might say that.

2877 You told me that an inquiry was held on account of that representation?—Yes, and they said that if the result of the test proved that the standard could be maintained they would withdraw all opposition to the standard.

2878. And they found it could be maintained, and after that the opposition ceased?—They found it could be maintained.

2879. And opposition ceased?—I do not know I could hardly say that, certainly the standard was maintained. That was the position as the Roscoe Committee left it. The Humidity Committee carried the thing a little further They recommended a somewhat similar standard without specifying the machinery for carrying it out. I have not a copy of their Report, but it has been more or less embodied in regulations. After dealing with the general standard of CO_2 they say that "*provided during any period in*" *which it is necessary to use gas or oil for lighting pur*" *poses before the end of the dinner hour on any day in*" *which gas or oil has been so used*" — that means in Lancashire in winter it would be two-thirds of the day. There is the whole period up to the dinner hour, and then from roughly half-past three or four on to closing time, when gas was again used—"*it shall be*" *sufficient compliance with the regulations in those times*" *if the means of ventilation are sufficient to secure ob*" *servation of the above requirement during daylight*"—that is the CO_2 standard—"*and maintained in full use*" *and efficient working order*"

2880 Is not that intended to meet a case that cannot be met otherwise? When you have gas under the conditions described there all you can do is to require that the ventilating appliances shall be kept up?—Undoubtedly.

2881. That is intended to meet an exceptional, not an ordinary, state of things?—It is ordinary for about four months in the year.

2882. For a certain number of days in the winter?—Every day in the winter for four months in the year.

2883 That would be a portion of a winter day. That was not what the Committee desired, but what they were obliged to recommend?—Quite so. You may take it as the standard for a third of the year.

2884. Would you follow that up by anything?—I have thought a great deal about the matter, and it seems to me from every point of view, both from the manufacturers' and even from that of the Government, that in the long run that is by far the best method to select for carrying out any particular standard of ventilation adopted, because it enables the manager, the manufacturer and the inspector readily to see whether there was compliance with the legal standard or not.

2885 How would the inspector do it? You have suggested to us that the inspector should have an indicator, but there are any number of fans and other ventilating appliances which have not indicators; and how could the inspector go in and take a glance and be satisfied that all the ventilating appliances were running?—If such a regulation were made, a speed-counter would be applied. They are very cheap.

2886 To every fan and ventilating appliance?—Every fan and ventilating appliance that was put in to comply with this.

2887 How would he tell some inlets were not closed or open? It would take much more than a glance?—I had experience of the plan for some years, and did not find it difficult

2888 Have you considered the recommendations of perhaps one of the most thorough investigations that has been made on ventilation by the Haldane Committee?—Very closely.

2889. If I remember rightly the Haldane Committee were strongly of opinion that the test should not be any mechanical appliance whatever, but that each individual manufacturer should be allowed to decide on his own ventilating plant, but the standard should be a standard of CO_2?—That is so.

2890. I take it those are the recommendations of a committee that sat for some four or five years and took more evidence on the point than any other committee that has ever sat?—I do not think they took any evidence from anybody. I never heard of them calling a single witness.

2891. Then they visited a large number of works?—They visited a considerable number of works.

2892 That was their recommendation?—That was their recommendation, certainly.

2893 Can you say anything more on the question of ventilation?—No, I think that would cover it I have not mentioned any question of what standard the Committee may think fit to adopt—the question whether it should be 6, 8, or 9.

2894. You mean the standard of CO_2?—Yes, if you think a CO_2 standard desirable at all. I am simply giving my views on the machinery for carrying out whatever standard is thought desirable.

2895. (*Professor Petavel.*) Do you consider that the inlets available in the shed would produce no influence on the output of the fan?—In an ordinary weaving shed the incidental inlets and outlets are very numerous I have tested this point hundreds of times, because I was struck with it. If a fan is a reasonably efficient fan, the openings in a weaving shed are so great that practically it is sufficiently constant, at any rate, to ensure this standard. This is not mere theory; because I formed the theory after I got the facts. I was surprised; I expected a different result. I had to look about for a reason.

2896. Are the openings chiefly in the roof?—They are largely in the roof. In an ordinary weaving shed there is sufficient space under the roof to act either as an inlet for exhaust fans or as an outlet for plenum fans

2897. In such cases, whenever the ventilation is exhaust ventilation, there is a draught at the door whenever that door is open?—Quite so.

2898. Do not you consider that indicates that an extra supply of air is coming in, and that therefore the supply of air passing through the shed depends on the size of the inlets available?—I tested that in this way. Of course it does indicate that at first. The conclusion I came to was, it is simply that the direction of the inlet was changed; it was changed from the roof to the door: the door happened to be a little easier.

2899. (*Mr Ewart.*) In the case of roof ventilation it is a limited space of great length?—Yes.

2900. In the case of the door ventilation it is a large opening suddenly opened?—Yes. I tried to test it by anemometer tests of the fans under conditions of opening doors and shutting them, and I have not the faintest doubt there must have been some slight difference, but it was not sufficiently great to show itself either on the anemometer or in the proportion of CO_2.

2901. (*Professor Lorrain Smith.*) Would not you have expected short-circuiting with exhaust fans?—Undoubtedly.

2902. Would not it be shown by the CO_2 results in those cases when it was conveyed to the door?—But the short-circuiting is constant almost in all these systems, because the bulk of the air is both driven out and let in from the roof. There is bound to be some short-circuiting, and I think there is clear evidence of that. Take the plenum system. The amount of air going into a shed is far greater than would be necessary to give a proper standard of CO_2, if there were even diffusion. This doubtless indicates short-circuiting; but I think that is past praying for, almost.

2903. (*Mr. Ewart.*) Apart from the ventilation system and the position of the inlet and outlet, is not there a considerable circulation of the air in every factory?—By strap action?

2904. And pulleys?—Yes, strap action in particular, and the normal diffusion of air—the different temperatures and different compositions.

2905. (*Chairman.*) You have made some remarks on the question of Regulation 2 of the Flax Regulations, which relates to dust in the roughing, sorting, carding, and preparing rooms. I do know that this question is not strictly within our inquiry, although there is a certain amount of humidity in some of these rooms, and humidity would do something towards laying the dust, but I should like to hear from you—I think it would be a matter of interest—what, in your opinion, has been done in this district of late years, what improvements have been made, and whether you consider them to have been thoroughly well done, and resulting in good results for the workers?—I was over here 15 years ago on a special inquiry about this, so I can make a comparison which is more thorough, at any rate as regards dust, than on some of the other points you put. There is not the faintest doubt that there has not merely been an improvement—that does not adequately express the charge—but there has been an absolute revolution in the condition of the dust departments. I can well remember in many of these rooms—the carding room in particular, and even the roughing and sorting rooms—if the room was at all long you could not clearly see the end of the room, as there was such an absolute fog of dust. Take roughing rooms when I went in in my younger days as Inspector. There was an absolute continuous bark of coughs going round the room. Now frequently you can go into a roughing room, and you may stay in it five minutes without hearing a single cough. There is not the faintest doubt that there the conditions have been wonderfully improved. I think the generosity of the manufacturers here in dealing with dust has been remarkable. I know of nothing to compare with it in the whole of my experience of factory inspection.

2906. That is very pleasing testimony to hear?—By the way, I ought to have mentioned on the question of the standard of CO_2, that I have prepared from the Annual Reports of the Chief Inspector of Factories, figures as to the actual standards reached or of the number that reached the 9-standard, and the number that exceeded it. You may take it, I think, practically 90 per cent. of the mills that are under the CO_2 standard easily reach the 9-standard, and many of them come far below; that is, they get a far higher standard of ventilation than the 9.

2907. That is a lower proportion?—Yes, indicating a more thorough ventilation than 9 would require.

2908. Is there anything you would like to say to the Committee?—There are one or two points. On the question of Regulation 3 of the Flax Regulations there is a requirement as to thermometers. It seems to me whatever method of testing heat is compulsory it should be in itself easily read. The thermometers that are sometimes used are such, that I think the ordinary unskilled man would hardly be able to read accurately two or even three degrees, and I think, that as regards thermometers, somewhat similar requirements might be made to those which have been made for cotton cloth hygrometers, requiring great legibility. It seemed to me the regulation as regards hygrometers for cotton cloth factories was a distinct improvement. In those factories hygrometers now have to be constructed very legibly, so that even an unskilled man can read them fairly accurately; and I think that is a very desirable thing. Then as regards hygrometers and thermometers the standard of humidity and of temperature should be shown on or near the hygrometer as clearly as possible. Years ago I asked an instrument maker to specially print a big notice in red that "a difference of at least two degrees must be maintained between these two bulbs," and let that in between the two bulbs, so that any operative looking at it sees at once what difference should be kept; and if the hygrometer is legible he can see that it is being done.

2909. Do you make any suggestion as regards the readings and returns?—Readings never seem to me to be of much value. There is a great deal of romanticism in the Irish nature, and I am perfectly certain some of them are not strictly accurate. One of my early experiences when I came here was the discovery of a man entering them up a week in advance. In any case they are not of very much value.

2910. Would you recommend the readings should be abolished?—Yes, I should certainly recommend that.

2911. Or failing abolition would you recommend any better method of taking the readings?—No, I am afraid the plan adopted in cotton cloth factories would hardly work here. It would not be of any very great value. Personally I think it is a matter, like other requirements of the Act, which should be left to the Inspector.

2912. In practice how often in a year would he be able to visit a factory to see if the requirement was being carried out?—In practice he would find what firms habitually keep near the limit, and he would pay special attention to them until they understood they had to keep within the limit.

2913. Do not you think if some official has from time to time—so many times a day—to take records of the thermometer, it is likely to keep in his mind that there is a regulation?—Yes, it certainly does that.

2914. You refer to the regulation made for cotton cloth factories. That was that some representatives of the operatives should jointly take the readings?—Yes.

2915. What objection would there be to that in this country?—I do not think there would be much objection. I am questioning whether as a rule the operative would be independent enough to contest any view of the reading that the manager took.

2916. But where they have jointly to sign their name, that they have taken observations and that on a certain day they found an irregularity, do not you think the fact that they have to sign their names to that might be some check?—It might be some check, certainly, but I am inclined to think many of the operatives anyhow would hesitate to sign a statement that there was an excess.

2917. Do you think the excesses are now recorded?—No, I do not.

2918. Then there is no check at all at present?—At present the check is the check of the Inspector.

2919. Which means about once in a year, perhaps?—Well, it depends. I do not know what they do here now, but I certainly went oftener than that to firms that I suspected of keeping a high degree of moisture.

2920. But there are probably at this moment factories in this district which have not been inspected for a year or two?—No, I should hope there is not a weaving shed or spinning mill that has not been.

2921. (*Professor Lorrain Smith.*) About the comparison of your experience in Lancashire and here in regard to the workers—do you think they suffer more discomfort in Lancashire than here?—Certainly in Lancashire in summer, owing to the high temperatures. I, at any rate, suffered more discomfort in the shed. I was in sheds a good bit both in Lancashire and here—more in Lancashire than here, because I was confined largely to sheds in Lancashire, but when I was doing heavy work in Lancashire sheds in summer, I frequently got uncomfortably hot.

2922. You think there is a distinct difference?—There is a distinct difference. As I say, my experience of weaving sheds here, in summer, is very limited. The two years I was here were cool summers, so that I do not pretend I can speak for the normal conditions; but certainly, in the two summers I was here, I did not experience the discomfort I did in Lancashire.

2923. Then about the health, on the same question of comparison?—The only evidence I had as to health in Lancashire—the only reliable evidence—was the interesting figures which were got together by the Blackburn Medical Officer of Health, and they seemed to me to indicate clearly that, with the improved standard of ventilation which the Roscoe Committee required—the 9-standard — you did get in humid sheds (because Blackburn is certainly humid as regards weaving) a distinct improvement in health. The figures collected, I think, would warrant the inference, that, having improved the ventilation, there was a distinct improvement in the health of the people. As regards evidence of that sort here, I have seen no corresponding evidence.

2924. So that you could not compare?—No, I could not.

2925. (*Professor Petavel.*) With regard to your evidence on splash-guards, have you found that the spinners object to them as being inconvenient?—In some cases they have, yes.

2926. And is that objection justified in your opinion?—In some cases it has been justified. Only this week I saw a type of splash-guard which seemed quite unnecessarily inconvenient. It was too high, and it was a little too near the spindle; and the consequence was it gave the spinner insufficient room to put her arm in, and there was a constant rubbing, which I have no doubt in time would be very unpleasant; and I think the objection in that case was perfectly sound.

2927. (*Mr Ewart.*) Is that a new type?—No, it was not a new type. It was one of the firm's own manufacture, but there was nothing novel about it; and as a matter of fact the firm—the same firm—were putting on a newer type, also of their own manufacture, in which those two faults had been remedied. I spoke to one of the spinners and asked her whether she did object to splash-guards, and she said she did object to the old one but not to the new one.

2928. (*Professor Petavel.*) So you think splash-guards to which objections cannot be raised on that ground are available?—To which objection after a time will not be raised, yes. As regards Regulation 12, which I did not mention, that requires the firms to provide respirators. It follows from what I said about the action of firms in clearing away dust, that I no longer think that regulation necessary.

The witness withdrew.

Mr. A——— M——— called and examined.

2929. (*Chairman.*) You are a weaver?—Yes, the last 30 years.

2930. Have you worked in what they call wet sheds all the time?—No, sir. I am only 20 years at the power loom weaving. I was a handloom weaver before that.

2931. When you were a hand-loom weaver were you doing close weaving? Was it very close or open weaving?—It was in a house like.

2932. Yes, but was the weave very close——?

2933. (*Mr Ewart.*) Was it fine sets?—It was fine; up to 24's.

2934. (*Chairman.*) Could you weave without humidity there?—Certainly. I wove 26's in a dry shop in the town of Lurgan.

2935. Did you ever wet the floor underneath the loom?—No.

2936. You just did it with the humidity that was in the atmosphere?—Yes, in the house and in the shop as well.

2937. What do you think about the humidity in the power loom factories?—Well, I will tell you about the summer months first. In the summer the heat rises from dinner-time, and the damp rises too, and it rises that high about four o'clock I had to quit—me and several others, it got that high. I had to go to the closet and sit for half an hour. My limbs were that feeble I had to go and sit because of the heat and damp both. Afterwards I throw off my waistcoat and open my shirt and trousers. It is very warm. I felt myself very sore and giddy because of the heat. I found out in a hot summer I had better keep my waistcoat on; it kept the damp out. If it had been a dry heat it would not have been half as bad. When you come out at night you do not want to go to the house, but keep walking. You take cold in your kidneys or some place, and the limbs are feeble.

2938. (*Professor Lorrain Smith.*) If you sit down at all you take a cold?—In your eyes and throat. The limbs are that feeble you could not walk very much after being in the damp. It is the first thing the heat and damp would do in the summer time, take your limbs from you. At the same time you have no appetite for meat. I have seen me go home at dinner-time in the month of July, and I have taken a drink of milk before going back to work. I could not take any food at all.

2939. (*Chairman.*) In the factory you work in, how do they get the moisture—is it steam or is it water?—It is the steam pouring out of a pipe.

2940. Have you ever worked in a place where they have a sort of water spray?—No.

2941. You have never seen that?—No, but I worked in a place at damask where there was no steam at all. In the winter months of frost the drops come from the roof without steam. I am working in a place this last fortnight with drops of water above my head, and I stand in water underneath.

2942. You do not think the damp is good for your health?—It is not good for the health. I have never been sick in my life, but there is plenty of young persons that is affected at present.

2943. Young persons?—Young ones. It is affecting my own limbs at the present time.

2944. You think it is bad for the health?—Yes, it is very bad for health. I can agree with it providing it is dry, but my health will not provide for the heat and damp both.

2945. Do you think it is good for the weaving?—Well, you need a fair share of steam for cambric yarn. You cannot weave without steam. In the summer time the steaming gets more pressure and the heat is that high the yarn will not grip the steam: it is always keeping the yarn dry. No matter what steam goes over it, it will not grip it. Of course, the higher the heat gets, it makes the yarn dry, and then they put on more steam, but it blows over the yarn, it will not grip it.

2946. We have heard all sorts of suggestions for making things better, and we would like to hear what you think would make them better?—Well, I would think that if the floor could be kept dry that would be a whole lot to the health of the worker. When the floor is wet and the steam is pouring over yourself it takes a very healthy, strong man to stand it.

2947. What else would you suggest besides that?—Well, if they could keep the heat down, keep it down in the summer months, I do not believe the damp would rise so high. The heat is great and the yarn dries, and then they put on more damp and the heat overcomes the damp and blows it on to the floor, and it takes the limbs off you. Imagine a person working at 80° or 82° of steam for four hours. Your very fingers will swell and the thread will drop out of your hand. You get that much exhausted about four o'clock, you have to quit and go away and get cooler.

2948. You want to get the shed cooler?—Aye, get the shed cooler.

2949. Can you think of any way to do that?—If there could be some other remedy taken to do it.

2950. We want to get all sorts of opinions from everybody we can. What remedy would you suggest?—If they could keep the heat down.

2951. But then, what would you do to keep the heat down?—Well, if they could get some kind of a machine for to keep the glass cool. When the heat rises it gets on the glass at the top, and then it comes down again. It makes the heat far worse. The roof is half glass, and the heat rises, and the sun striking on it too, it makes a double heat.

2952. (*Professor Lorrain Smith.*) Do weavers object to this heat generally?—Yes, it is proper torture in the weaving place in the summer time. There are some, aged 14 to 21, they are not able to stand it.

2953. Is that a general opinion? Do the other weavers share your opinion on that point?—Well, a whole lot of them, the majority of them do. Of course, they cannot work with the heat, they are killed, with their heads down, they cannot pluck up at all.

2954. Some of them, telling us about it, do not seem to have such a strong objection. You have?—That is the very thing. It is the strong steam pouring out that causes so much heat.

2955. But they do not seem to mind it so much as you do, a good many of them?—No, they do not; but there is a whole lot complain in the summer months. There is many a worker stays out in the afternoon.

2956. (*Chairman.*) Where do you work now?—I work for ——.

2957. How long have you worked there?—Thirteen years easily.

2958. (*Professor Petavel.*) You say steam is necessary for cambric weaving?—You cannot do without steam.

2959. If it was cut off, could you go on weaving?—Well, of course you could weave without steam right enough, but then the yarn would begin to break. You would need some moisture to help to keep the yarn soft. You do not want a whole bust of steam and a whole bust of heat.

2960. Cutting it off would mean more work, you think?—Taking the steam off?

2961. Yes?—It would hold workers back. You need a certain amount of steam to soften the yarn a little, but you do not need a whole pressure of it all at once. Sometimes the steam comes specially at six o'clock in the morning, and you could not see two yards in front of you for steam; and then the shop is damp. They continue the steam the very same way and they throw on extra damp through the shop.

2962. Do you know why they put on more steam than is necessary?—Yes, at times they put on 13° more than they ought to.

2963. Why?—Sometimes it is put on because it makes the yarn soft and moist.

2964. Why do they do that?—I cannot tell. They do it, anyway. If I complained—"You are not the only one working in the room."

2965. I have woven a 28^{m} in a dry shop without steam at all.

2965*a*. (*Mr. Ewart.*) That is on hand looms?—Yes, here in Lurgan.

2966. Was that a hand loom?—Yes, a hand loom, but when I dress it it softens the thread and puts a wee bit of moisture in it.

2967. (*Professor Lorrain Smith.*) What did you put in the yarn?—When I dress it and dry it I put plenty of tallow in.

2968. (*Chairman.*) Is there anything else you would like to tell us?—I would like to speak about the winter, especially in frost. Where I work, when the frost comes there are big drops of water above your head from breakfast time up to four or six at night, and they are dropping down to the floor. You stand on the damp floor and see big drops of water above your head dropping upon your shoulders. That is very hard for the workers.

2969. Is there anything else you would like to say? Just think if there is anything else you would like to tell us?—They keep the heat very high in the summer and in the winter you are obliged to work with your coat on after breakfast. You cannot throw it off for the cold. They ought to have some heat in the winter. They have the heat in the summer, but there is no heat in the winter at all, only when the steam rises itself about ten or eleven o'clock.

2970. Anything else?—No, I think that is all.

The witness withdrew.

Mr. H—— M—— called and examined.

2971. (*Chairman.*) What are you?—I am a weaver.

2972. You have been a weaver for how long?—For upwards of 24 years.

2973. Where are you working now?—In ——.

2974. How long have you worked in that same factory?—In the same factory?

2975. Yes?—Well, I have been in it, with the exception of about nine months, this last 18 years.

2976. Is there steaming in the factory?—Yes, steaming.

2977. Is it raw steam? I mean to say live steam? Just steam from pipes?—Yes, just steam from pipes.

2978. Is it not water spray?—No, hot steam.

2979. What do you think about steaming? Tell us what you think?—There are some times we get too much at this time of the year. There are what we call good weaving days. That would be what we might say the atmospheric condition would be normal. For a day like this, for example, less steam would be requried.

2980. This would be a good weaving day?—Yes.

2981. A damp day is a good weaving day?—Yes, less steam is required.

2982. When it gets frosty and the wind in the east you would require more?—Yes.

2983. In the winter you do not suffer any inconvenience from heat?—Not in the winter time.

2984. Not from steam?—From the dampness caused by steam.

2985. Do you think they put on too much?—I think we get too much in the winter time. They do not take any heed of atmospheric conditions in turning on the steam. In the place where I weave they turn it on no matter what the conditions are, and allow it to blow off all day.

2986. On a day like this you would like them to turn off a bit?—We could do with less than we get.

2987. What about summer months?—In the summer the temperature rises very high. I have often seen it 87°, and once or twice it has been 90° and 89°.

2988. That is on the dry bulb or wet bulb?—On the dry bulb; the wet bulb would be a couple of degrees lower.

2989. Two degrees lower than what you have told us?—Two degrees lower than the dry bulb.

2990. You told us certain temperatures—87° and even 90?—It varies according to the heat of the day—according to the sun's rays.

2991. You have seen it up to what?—I have seen it up to the length of 97°.

2992. That is dry bulb?—Yes, dry bulb.

2993. That would be about 95° wet bulb?—Yes.

2994. (*Professor Petavel.*) Do you remember when that was?—It was in 1905.

2995. (*Professor Lorrain Smith.*) Did you work then?—I have never seen it as high since then.

2996. Were you able to work then?—You had to work. I could tell you the condition is far easier imagined than described—the suffering that you had to endure.

2997. (*Chairman.*) That would be a very extreme case?—That would be a very extreme case.

2998. Can you throw your mind back to the summer before last?—I have seen it 90°.

2999. What would be the condition of the workers?—Well, it is just very, very bad. It is simply unbearable—just as much as you can really suffer.

3000. Tell us what sort of symptoms occurred? What was it affected you?—You feel a sensation that you cannot breathe, until the perspiration begins to pour out of you, and it relieves you a little. You cannot get on with your work. It robs you of your vitality. You cannot feel the same energy in working. Another thing I would wish to say, it prevents you getting on with your work, because the water falling from your hands on these fine threads causes them to get damp and you cannot piece them.

3001. What about when your work is done? How do you feel at the end of the day's work?—When the day's work is done you may go home and sit at the fire, but you need a whole change of clothing before you go out; you need a change altogether. I have seen my very suspenders when I could wring water out of them. I would wish to say the women suffer more than the men, for natural modesty prevents them taking off as much garments as what a man can do, so they suffer more

3002. Of course we have heard all sorts of evidence from different people all over the country, but we do not want to hear one class of evidence only You have, perhaps, discussed this matter with your fellow operatives, and probably with the men and women who work in the shed. What do you suggest to make it a bit better?—To make it cooler in the summer-time

3003. More comfortable?—I think to do away with steam Hot steam raises the temperature.

3004. What would you have in place of it?—Well, I could not suggest, because I have no experience; but I think that a better system could be tried—atomised water would be better

3005. You think atomised water would be better?—Yes, I think it would be.

3006. Of course you would not say there must not be some artificial humidity?—No, because it is absolutely necessary for weaving.

3007. You could not weave without it?—No, you could not weave without it.

3008. But you would like to see atomised water tried?—Yes, I think it would reduce the temperature in the summer-time

3009. Can you suggest any methods of cooling by ventilation?—There is no ventilation in the weaving shed—comparatively little, and the ventilation of course is taken from the roof, and the volume of air that comes in is not sufficient to ventilate the shop properly.

3010. Have you at any time made representations to your employers about the great heat in the summer?—Oh, I have never made any representation, because I think it would have been useless indeed

3011. Have the workers as a body?—They might speak individually and it would have no effect. If they took collective action of course it might, but they do not do that.

3012 (*Mr. Ewart.*) Have you ever worked in a factory where they use atomised water?—I worked for a few months in a factory in Portadown a few years ago. It was in the summer-time, and we could bear the temperature There was no heat

3013. Was that in as hot weather as you had in the summer you were speaking of before?—No, it was early in the summer, in the month of May. You do not feel the heat completely until you come to July or the end of June, but I have heard workers who have worked in these places say it does reduce the temperature

3014 (*Chairman.*) Is there anything you would like to tell us?—Well, the effect of excess of dampness upon fine yarn: I would like to try and give you an illustration, gentlemen. The yarn, in the process of weaving into cloth, undergoes a constant amount of friction. That is by the shuttle passing across and the reed going up and down. You might compare it to a saw passing across a piece of timber; and when it is a very damp day it softens the dressing and causes the dressing to collect in little hard knots, and eventually that breaks the thread This is the opinion of any experienced weaver doing fine work.

3015. And that is due to what?—It hinders you in your work.

3016. How would you remedy that? Would you have less humidity?—Less humidity, yes. Less humidity would be the remedy for that. I hold that excessive humidity is a detriment to a weaver's work.

3017. You say excess, but it would be difficult for you to tell us where excess begins, I suppose?—It would depend on the atmosphere, the atmospheric conditions

3018. It is rather difficult to say in general terms where excess begins?—No, I could not lay down the line just there.

3019. (*Professor Petavel.*) Do you attribute this excess to carelessness on the part of the mill manager or man in charge of the steaming?—Yes, I would, because they take no heed of the atmospheric conditions at all. You get the same volume of steam no matter what kind of day it is.

The witness withdrew.

Mr. J——— M———called and examined.

3020. (*Chairman.*) What are you? What is your trade or profession?—A weaver.

3021. How long have you been a weaver?—Thirty-five years

3022. Where are you working now?—I am working at ———.

3023. How long have you worked there?—Sixteen years past.

3024. Have they got steam there?—It is very bad.

3025. Wait a bit, they have steam there, have they?—Steam, yes

3026. That is for humidifying, for damping?—Yes. I could not explain; I am no scholar, and I cannot explain what you say; but it is very bad—the steam, the dampness.

3027. But have they got steam blowing into the shed?—Yes, they have.

3028. What for? What is it for?—It is for the yarn.

3029 For making it softer?—Yes.

3030. Is that a good thing or is it a bad thing?—Well, for some cases, for fine yarn, it does not agree with it, and for coarse it takes plenty of it. I am weaving a 23-hundred now, nearly the finest that is woven in the shop; and I keep a peg to stop the steam getting on the yarn. For coarse yarn it takes more of it. For fine yarn you could not work it at all with the steam on.

3031. (*Professor Lorrain Smith.*) Do you turn the steam off?—I do not turn it off, because if I turned it off the other people weaving coarse yarn would be off; I put a peg into the nozzle and it takes it off my work.

3032. (*Mr. Ewart.*) There are very few in the whole of Ireland as fine as this.

3033. (*Chairman.*) This is something quite new I understood the finer it was the more moisture you want. Is not that so?

3034. (*Professor Petavel.*) What sets are you weaving?—I am weaving a 23-hundred

3035. Do you want more or less steam for a 23-hundred or a 16-hundred?—You could not work at all with steam on a 23-hundred. For a coarse yarn it requires plenty of steam.

3036. Would you rather have no steam at all for a 23-hundred?—I have got no steam, only just as I get it, because I have put a catch in it, and I keep it pegged up If I turned off the cock I would be leaving the other weavers idle for steam

3037. Could you weave in a room with no steam at all? If there was no steam in the shed at all could you weave?—According to some sets of yarn.

3038. (*Professor Lorrain Smith.*) But taking your yarn. Supposing they were weaving nothing but your 23-hundreds in your shed?—Could I weave without steam?

3039 Yes?—Oh, yes, you could. It does not require any steam on fine work.

3040 No steam at all?—Yes, on fine work; but that is a thing you hardly ever get.

3041. (*Professor Petavel.*) You have never tried it without steam?—No. You have to work fine yarn with the steam it takes for coarse yarn.

3042. (*Mr. Ewart.*) I think I know what he means. These jets are generally made with four holes in, and what he means by having no steam is not that he does not want any moisture, but he does not want the steam blowing down on the loom.

3043. (*Professor Lorrain Smith.*) But then he says he could do without steam altogether.

3044. (*Mr. Ewart.*) I do not think he understands exactly.

3045. (*Mr. Cummins.*) I do not think he is clear on that. Do you think you could really weave it without steam?—No, I could not, without steam.

3046. Yes?—Certainly. I have not got no steam since I got the peg in, only what is blowing right round the room.

3047. But the steam is round you?—Yes.

3048. (*Mr. Ewart.*) That is what he means; he does not want direct steam?—I could not weave without the steam on.

3049. (*Mr. Cummins.*) How near is the steam jet to you?—Just by the side. The pipe is next to me. That pipe has room for three or four others on the other side.

3050. (*Mr. Ewart.*) There is generally one jet to four looms.

3051. (*Mr. Cummins.*) He stops his own jet.—I have gone home with the drops falling from the top of the roof. They said it would make me grow, and I says I am past growing.

3052. (*Chairman.*) What about the hot weather, is it comfortable in the shed?—It is right enough in the hot weather; it is not so bad in the hot weather.

3053. Not so bad in the hot weather?—No, it is not.

3054. (*Mr. Cummins.*) Can you have the heat all right?—We can have the heat right enough. It would not throw me off my loom.

3055. (*Professor Lorrain Smith.*) Some weavers complain of the heat?—Ah; in the summer-time it is a wee bit hot sometimes.

3056. But you would not mind it much?—No. Could do with it regular.

The witness withdrew.

Mr. J—— B—— called and examined.

3057. (*Chairman.*) Are you a weaver?—Yes.

3058. How long have you been one?—Over thirty-five years.

3059. Where are you working?—At——.

3060. And how long have you worked in that factory?—Over twenty years.

3061. (*Mr. Ewart.*) Is that the —— Factory?—Yes.

3062. (*Chairman.*) Have they got any steaming in that factory?—They have.

3063. Is it steam jets?—Yes.

3064. Not water humidifying?—It condenses into water.

3065. But it comes in the form of steam?—Yes.

3066. Do you think steam necessary for efficient weaving?—Well, I believe some would be necessary, but not too much of it. We have got too much of it.

3067. What effect has the heat and the steam together on your health, or your comfort, in the hot weather? For instance, do the workers feel comfortable in the summer?—No, it is rather warm in the summer.

3068. Rather warm?—Rather warm, and not warm enough in the winter months.

3069. By rather warm do you mean that it is too warm?—Too warm.

3070. Is it sufficiently warm to really cause discomfort to the workers?—Yes, it is. I myself have come out with semmits and shirt, even my drawers, all wringing, even coming through my pants here from the dampness of the shop.

3071. That would not be comfortable?—No, it would not.

3072. Does it affect your health in any way at all?—I am greatly troubled with rheumatism in my shoulders and legs.

3073. And after the day's work, do you feel as if you had perhaps done a bit too much?—Yes, rather overtaken, dull. I am under medical treatment at the present time for the rheumatism.

3074. How long have you been under treatment?—I only went to the doctor this week, but every year I mostly suffer from it.

3075. Is it in the winter or in the summer?—Mostly coming in the winter, the autumn.

3076. But I am thinking now of these very hot days in the summer: how does it affect you then?—At that time the pains is not troubling.

3077. You do not suffer from rheumatism then?—No, not in the summer.

3078. Of course this summer was a very cool summer?—Yes.

3079. The summer before was a very hot summer?—Very hot.

3080. Do you remember the working days in that very hot summer?—Yes.

3081. How did those days affect your health?—Well, the health was good enough, sir, but we had to go in—at least, I had to go in without any semmits and drawers, and then I had to put them on in the evening. You could not keep any semmits or anything on to catch the sweat.

3082. Is this amount of steam necessary for good weaving?—No, sir, there is too much of it in my opinion. If there was more heat there would not be so much call for the steam; it is the cold that affects the yarn and makes it bristly, so they have to get the steam in to make it stretch and come out. With the dry weather it all cools and bristles up, so they have to put steam on the yarn to make the breadth.

3083. Can you suggest to this Committee anything that could be done in a humid shed—that is a weaving shed where they have the steaming going on—or left undone, for the comfort and the health of the workers?—I could not suggest very much.

3084. Can you suggest anything?—Well, in my opinion it is the drops that fall from the ceiling—if they could do something with the roof. In one shed there the roof is sheeted and the drops run in that direction and come down on top of the heads of the workers and their shirts and other clothing.

3085. Do you think any effort could be made to keep the shed cooler in the summer?—Yes.

3086. What might be done in that way, do you think? What would be the best way of making it cooler in the summer?—By spraying the roof with water; they could keep the roof cooler.

3087. Anything else?—I do not know of anything else.

3088. What about ventilation? Have they got plenty of ventilating fans there?—Yes, the ventilation is very good there, from what I remember it.

3089. Is there anything else you could recommend to make it more comfortable for the workers?—No, nothing, except if they can keep the place dry. That is all we want—to keep the floor dry.

3900. Is there too much steam?—There is too much steam, and it turns into water. Yesterday in one of the places there was over a quarter of an inch water lying. That I measured myself on the floor line.

3091. You think there is sometimes too much steam?—Too much of it.

3092. Is there too much in the summer?—Yes, sometimes, according to the day. There is some days we have no call for it, according to the atmosphere outside.

3093. (*Mr. Ewart.*) When you speak about it being a cold shop in winter, can you tell us what the temperature is that you speak of as cold?—It would go down as low as 45° cold in the winter.

3094. Is that at starting time?—That is so, in the month of November.

3095. Is that when you come in in the morning?—Yes, coming in in the morning.

3096. When does it get up to 60°?—It does not go up to 60° that day. They have not enough heat in the place to take it up to 60° in the winter months. It was 63° yesterday about one o'clock.

3097. With the thermometer 63°, do you get good weaving?—Yes, there was 61° damp.

3098. (*Chairman.*) Is there anything you would like to say to the Committee?—If the place was heated up more in winter. That is what the weaver is all complaining of. It is the cold. It is almost freezing point in the winter mornings.

3099. Too cold in the winter, and I suppose too hot in the summer?—That is so.

3100. (*Professor Petavel.*) Which is worse?—The cold is very bad, I expect, for the girls and women coming in in the winter mornings with very little on. You would be vexed to look at them and see them standing in the cold in the morning.

The witness withdrew.

EIGHTH DAY.

Thursday, 29th May, 1913.

At Belfast.

PRESENT:

COMMANDER SIR HAMILTON FREER-SMITH, R.N., C.S.I. (*Chairman*).
Mr. HENRY CUMMINS.
Mr. HERBERT EWART.
Professor J. E. PETAVEL, F.R.S.
Mr. D. R. WILSON (*Secretary*).

Mr. JAMES McCARTNEY called in and examined.

3101. (*Chairman.*) Would you kindly tell us your name?—James Macartney.

3102. And what is your occupation?—Manager of the weaving factory of The Falls Flax Spinning Company.

3103. May we ask how many years you have had experience in weaving sheds?—Twenty-four.

3104. And in your present position?—Ten years.

3105. Have you had experience in the weaving of both coarse and fine?—Mediums and fine.

3106. What class of goods are you weaving?—Fine shirting linens, fine cambrics and medium linens.

3107. (*Professor Petavel.*) What is your finest set?—22^{00}.

3108. (*Chairman.*) What do you consider the best conditions for efficient weaving in terms of the temperature and the difference between the wet and dry bulbs?—The best weaving temperature is from 68° to 72°, and from two to three degrees between the wet and dry bulbs.

3109. For efficient weaving what is the minimum distance between the wet and dry bulb thermometers you would think desirable?—Well, two.

3110. Then when you get to three you are going to beyond what you want. Is that so?—Yes, going beyond; the weaving is not so good.

3111. Would you say that for all classes of goods?—Well, for coarse goods it does not matter so much, but for mediums and fines it is absolutely essential we should have that.

3112. How would you define fine, medium and coarse?—My experience, as I have said, relates to 9^{00} up.

3113. I do not know if I make myself clear. I want you to state first of all, what you consider to be fine?—I would consider from 15^{00} up as fine.

3114. And what medium?—From 9^{00} to 15^{00}.

3115. And coarse?—Coarse, 9^{00} down.

3116. I think you told us that for the fine you consider a minimum of two degrees between the thermometers is necessary?—Yes.

3117. Have you verified that opinion in any way by actual experiment?—Yes.

3118. Could you give us the result of your experiments?—We have tried turning off the steam some time ago with the result that the yarn breakages were more than twice the amount than when we had the steam on. The cloth was very unsightly. It would be unsaleable. We lost very much in the length. The cloth was out from half an inch to an inch in breadth, with the result that we lost two yards in length. It would render the cloth useless for sale and the workers would have twice the work to do and would earn, I would say, just about half the money.

3119. How long ago did you try the experiment?—About two months ago.

3120. How long did the experiment last?—For two hours. We turned off the steam for two hours and kept it off until one o'clock. Some of the yarns would not work at all; they would absolutely stop the looms.

3121. Coming to medium, what would you suggest as the minimum difference between the thermometers?—Two degrees also.

3122. For medium?—For medium.

3123. Have you verified that opinion by any actual experiment?—Of course our shop consists of medium and fine all through the shop, and what applies to the fine applies to the medium, with the same result in both cases. The same difficulty applies to them.

3124. When these experiments were going on did you find the cloth suffered as much?—Quite as bad, just the same difficulty and the same results.

3125. You satisfied yourself on that point?—I satisfied myself on that point, yes.

3126. Coming to the coarse, what would you suggest as the minimum difference?—I have had no experience of coarse goods.

3127. In your factory you only weave fine and medium?—From 9^{00} up, yes, fine and medium.

3128. Can you tell us from memory up to what temperatures you get on very hot summer days?—On a very hot summer day we go on to 80°.

3129. Can you recollect going beyond 80°?—No, I cannot recollect going beyond 80°.

3130. (*Mr. Ewart.*) Are you speaking of the wet or dry bulb temperature?—The wet bulb.

3131. (*Chairman.*) What system of humidification have you?—The ordinary, blowing off steam.

3132. Have you ever tried any other system?—Never.

3133. What ventilation have you?—Ordinary Blackman fans.

3134. Are they drawing air out or pumping it in?—Drawing air out.

3135. Have you any system of inlets?—No, just the ordinary doors and openings.

3136 Do you keep these going both winter and summer?—Going all the time. When the engine starts the fan starts.

3137. On these days, when you speak of the wet bulb reaching 80°, the fans, I presume, were running?—Yes.

3138. Have you any health statistics with regard to the workers?—We have.

3139. How long have they been kept?—Well, we have a large number of girls who have been weaving with us from 20 to 30 years

3140. Have statistics been kept?—In my experience I know girls that have been there for the last 24 years

3141. I mean are there any regular statistics showing the number of people off sick during the year or month?—No regular statistics.

3142. Any opinion you express on that point is just from general knowledge?—From general knowledge.

3143. Do you find that the workers in the weaving sheds are able to stick steadily to their work?—Very steadily to their work. We have some workers in the weaving shop who have been there for almost 30 years, and only a few days' sickness in that time.

3144, You told us you have some workers who have been there for 30 years?—30 years.

3145. Can you tell us anything about any that have had to leave in consequence of the work not suiting them?—No, I never came across any person who left owing to health conditions.

3146. You never came across any persons who left in consequence of the work?—None

3147. I understand that while you are weaving you have from time to time to alter the weights for stretching? The weight, I understand, is on the back beam, and as you go on you have to watch and to adjust the weights, I presume?—Of course the conditions are always much the same and the weight is placed in a certain position.

3148. When you are making these experiments to test the breakages, what was done in regard to the weighting?—In some looms we did not weight at all, we just let the yarn go out. In other looms we put on the extra weight with the result that the more weight we put on the more breakages occur.

3149. I want to have it on the evidence. I presume you were trying honestly to get at results, but were you careful that there was no extra weight put on during those experiments—I mean more than would have been done under ordinary conditions?—Absolutely none. The weight was just put on to bring the cloth the proper width If we were weaving 38, we put on the proper weight to keep it 38

3150. You personally took care it was done right?—Yes.

3151. Because there might be a temptation to some person who was interested to put on a little extra weight?—The thing was very carefully watched.

3152. You are satisfied it was carefully done?—Yes.

3153. (*Mr. Ewart.*) With the extra weight put on, say with 38 inch, was the cloth as sightly and marketable as if the steam had been on?—No not near so mellow or so nice in quality.

3154. Not as well put together?—Not as well put together, but it looked a great deal coarser than the ordinary web. The extra breakages taking place, and the loom being off and on, does not give the cloth the same chance.

3155. (*Professor Petavel.*) On the looms that were not weighted more than usual were the breakages increased by the decrease of moisture?—They were.

3156. Have you any experience of humidification by cold-water spray?—None

3157. If the cloth was woven with less humidity and the weight was not increased, would the cloth be marketable or would it be depreciated in value?—It would be depreciated in quality, and we should require to get a great deal higher price for the goods as we should not be able to get the outcome in the cloth. If we do not put on the weight and get the proper width the outcome is less. We may lose a yard or two yards in the length, with the result that we would have to put, say, from a farthing to a halfpenny a yard on the price of the goods. One-sixteenth of a penny puts us out many a time. We should be completely out of it as regards price, and the quality would not be anything like what it is at the moment

3158. Then the proper width cannot be recovered in the process of bleaching afterwards?—It may come out all right in bleaching, but of course we sell on what we get on the loom. If we put in 90 yards of yarn expecting to get 80 yards and we cost on 80 yards, if we do not weight up the loom and get 80 yards, we lose from a farthing to a halfpenny a yard according to the sets The cloth would not be so sightly or saleable compared with our goods and the turnoff would also suffer. The weaver could not do the same quantity of weaving as she does at the moment, or else she would have to work much harder I may say we have an old woman over 70 years of age working at the present time from 6 o'clock to 6 She makes plenty of money and has good health, so the conditions must be favourable.

3159 (*Secretary.*) Were the experiments you have described those at which we were present in your shed?—They were.

3160. (*Chairman.*) I want to go back to one point. Have you ever made any special efforts to cool your sheds in the summer?—None, except there are a few very warm days each summer, and on those days we open the doors and the windows at the meal hours to give a blow through, with the result that it is cool for at least two hours after the weavers come in again; then the sun goes down.

3161. You want a certain relative humidity for efficient weaving, do you not?—We do.

3162. Is it absolutely necessary in the winter as well as in the summer to have a difference of only two degrees between the wet and dry bulb thermometers?—Yes, just the same

3163. Whether hot or cold you still say you want two degrees?—Yes. The weaving suffers if we go beyond it.

3164. I forget the exact position you told us you hold?—Manager.

3165. Is there any society representative of managers?—No, we have no society.

3166 There is no society you think which we might call upon to send a witness as a representative of the gentlemen holding similar positions to yours?—There is no recognised society.

3167. (*Mr. Cummins.*) Do you think it a fair test to shut the steam off at once for two hours?—Not a fair test in our favour, because the conditions were good when we shut it off. The proper test would be to go on Monday morning when the shop has been dry for two days, and see then what effect the cutting off of steam would have. When we cut the steam off the steam had been on for a few hours, with the result that the atmosphere was in a fair condition. It did not give a proper test shewing what the effect is of having no steam.

3168 Yes, but I mean that both the wet and dry bulb temperatures would drop?—Yes, they are bound to.

3169. By shutting it off for two hours at a time?—We had it on from six o'clock in the morning up to eleven Then we shut off at eleven, with the result that the atmosphere must have been in a favourable condition. The effects would have been a great deal worse if, say, we had shut it off, or not put it on, at six o'clock in the morning; it would have been a better test. When you get the atmosphere into a certain condition it takes some time before that condition gets away, and you have the effects of it for an hour or two afterwards.

3170. After the steam is shut off there are no breakages of any significance until after the first half-hour?—No, the conditions are much the same for a short time.

3171. It must have dropped about two degrees in that time?—Well, I did not take notice of the drop in that time.

3172. After that time the breakages begin?—Yes.

3173. (*Chairman.*) At what temperature did you cut off the steam when you were making your experiments?—Speaking from memory, I think about 70°.

3174. (*Secretary.*) It was just under 70°? It was one of the most favourable days for humidity that we have had this year, that particular day.

3175. (*Chairman.*) Would it have been possible, do you think, to cut off the steam, say for half an hour, or even an hour, and then put it on again, without much affecting the weaving?—No, the effect becomes noticeable immediately the steam is all shut off.

3176. But according to the results it does not seem that there was practically no effect until about an hour after it was cut off?—Yes, but that particular day was the most favourable for humidity that we have had this year. If it had been a week before or a week afterwards the breakages would have occurred five to ten minutes after the steam was cut off.

3177. I am not saying that it is a fact, I am only suggesting it as a possibility, that if the steam had been put on again up to a limited extent when the breakages first began, the breakages might not have gone on?—Of course, the weather is such an important factor in the weaving that you would have to take each day according to the atmosphere outside. As I said before, that particular day was a most favourable day. It was a humid and a warm day.

3178. (*Professor Petavel.*) Would you be willing to try one more experiment of the same kind?—Yes, we would.

3179. (*Chairman.*) If we gave you notice, could some of the members come and be present to see it?—Yes.

3180. (*Mr. Ewart.*) Have you made any observations in your experiments as to how soon you begin to feel the effect of the shutting off of the steam?—Yes. As I have said, a great deal depends on the condition of the day, the atmosphere outside. You see there are days you would feel it immediately, and other days when it is humid it would be considerably longer.

3181. We have had evidence given here some months ago that until perhaps a turn or two turns of the beam are woven off the yarn is benefiting by the damp or the moisture that still remains in the shop?—Yes.

3182. It had soaked into the beam so far?—Yes.

3183. Have you observed anything to show you that it is a practical point?—No, I have not observed anything, but, as I said before, I would always say that the day the experiments are tried on is a very important factor. One day it may go half an hour, another day ten minutes. If there was an east wind or a north wind you would immediately feel it. A day like to-day, that is balmy and warm, you cannot feel it for half an hour. There are weeks that are splendid, and on days when there is an east wind or a north wind all the steam you blow off is hardly enough.

3184. (*Chairman.*) Have you ever heard of or seen any methods of applying humidity locally, by which I mean applying it directly to the warp?—No, but I have heard of it. I have heard of a steam pipe being taken up a dry shop and the steam blowing on the beams on either side. It was not a success because the atmosphere right round was not in a proper condition. It would be most difficult to apply the proper humidity to the yarn direct, because you might give it too much, and too little is just as bad. I do not think it could be applied just to make it weave right. You must have the condition of the atmosphere round in a proper state.

3185. You have no actual knowledge of it?—No actual knowledge. I have made inquiries about it, and that is what I have heard.

The witness withdrew.

Dr. Elias Purdon, M.B., C.M. (Edinburgh), called in and examined.

3186. (*Chairman.*) You are one of the Certifying Surgeons for Belfast?—Yes.

3187. How many Certifying Surgeons are there?—Two.

3188. How long have you held the office of Certifying Surgeon?—Since March 1906—about seven years.

3189. (*Mr. Ewart.*) Is not it a fact you were doing the work for your father?—Temporarily for my father on several occasions.

3190. For a good many years?—Well, off and on since 1898 when he wanted a holiday, and when he was ill.

3191. (*Chairman.*) I think you understand the nature of our inquiry?—Yes, I have a good idea.

3192. You have probably seen an explanatory memorandum saying what the object of our inquiry is?—Yes.

3193. Have you had any opportunities of seeing the condition of weaving factories and spinning mills?—Yes, I have been through them a great many times.

3194. And of course you are aware that in the weaving sheds there is a certain amount of artificial humidity introduced?—Yes.

3195. And probably you know that in the hot weather the temperatures are very high?—Yes.

3196. Have you had any opportunity of knowing up to what height the temperatures go?—No, I have not; I have only heard.

3197. You have no direct knowledge on the question?—No personal knowledge, no.

3198. Have you formed any general opinion as to the effect on, first, say, the weavers in working in these hot, humid factories from a physiological point of view?—Well, only their own statement. They say they are very tired, and only able to lie down afterwards. That is in the hot summer weather, and of course they perspire a great deal.

3199. You have their statements?—Yes. They say it is not so bad in the winter, but in the summer months they feel very tired after the day's work.

3200. Have you been able to form any general opinion as to the physiological effect of working in hot, humid atmospheres?—No.

3201. You have had no opportunity of making any investigation of that sort?—No, not yet.

3202. I think you have been invited by Dr. Legge to make some investigation of that sort?—Yes, during this summer.

3203. And I think Dr. Legge has suggested the lines of investigation?—Yes, I have received a letter from him.

3204. Has he sent you a copy of the Report of the Committee on Humidity in Cotton Weaving Sheds?—Yes.

3205. Passing on from the weaving sheds to the spinning mills, have you had an opportunity of seeing spinning rooms?—Yes, frequently.

3206. How do they strike you from the health point of view?—They feel very hot to me, personally. I am very glad to get out of them; but, of course, I have more clothes on than the workers have.

3207. What has been the condition of the floors?—Generally damp.

3208. Would you say damp, or, in some cases, wet?—In some cases wet; yes.

3209. Are you able to give us any statistics as to the effect on the spinners of working in this moisture?—Some years ago I took the body temperatures of some children working in spinning rooms. They were not taken in the spinning room, though. The children were brought directly from the spinning room to another room where I was.

3210. Will you tell us what the results were?—I took no notes. It was only for my own information at the time, and I remember distinctly several of the children's temperatures were raised. One went up to 101°, I think. They were all healthy children. I do not know what the temperature of the spinning room was. I did not take that at the time, unfortunately.

3211 But you took the body temperature?—Yes.

3212 Was it mouth temperature?—Mouth temperature, on a hot summer day.

3213 How long was the thermometer allowed to remain in the mouth?—Two or three minutes—two minutes.

3214. There are some clinical thermometers supposed to act at once, and some take a long time?—It was supposed to be a half-minute thermometer.

3215. Could you tell us how many temperatures you took?—About a dozen.

3216. But you have no actual figures?—No, I took no notes.

3217 From recollection can you tell us what the results were?—Well, the children seemed all right; they were free from disease or anything of the sort. They did not complain at all.

3218 But what were their body temperatures as far as you remember?—100°, I think. I am not quite sure, but I think one was 101°.

3219 The normal being——?—98·4°. Of course these were children—half-timers.

3220 (*Mr Ewart*) Was it a girl who had the temperature of 101°?—It was a girl

3221 Do you know what her temperature was before she came to work?—No. It was a very hot summer day

3222. (*Chairman*) Have you, from observation, or statistics, or hospital practice, any information that you can give us in regard to the health of the people in spinning rooms as compared with other departments or other branches of labour?—No, I am afraid I have not. As far as I personally know they do not seem to suffer more than any other workers. The illnesses they suffer from are common to workers in other trades.

3223. Have you any knowledge of the homes of these workers?—Yes, I have frequently been in their homes.

3224. We have heard some people say there is a want of nutrition, that some of them do not have food enough?—That is true. Most of them live on tea and bread, as far as my experience goes. That is the principal diet.

3225 Do you think there is anything in the alleged excessive tea drinking that might affect their health?—Yes. They drink very strong tea

3226. And in large quantities?—Large quantities, several times a day—four or five times a day sometimes.

3227. But have you any actual knowledge as to whether they have sufficient nutritious food?—I do not know. I suppose they could get it if they wanted it.

3228. Of course that is a question of money, is it not?—Sometimes it is to save trouble It is much easier to make tea than it is to cook a dinner.

3229. Probably you have no knowledge of the wage question?—No

3230 (*Professor Petavel.*) Did you gather any impression, from your knowledge of the working conditions in Belfast, as to whether the spinners or the weavers were less healthy than the rest of the industrial population?—No. The weavers seem a better class of workers—better dressed, and better fed than the spinners I understand they can make higher wages than spinners can. That may have something to do with it.

3231. You have not been able to trace any direct effect of the conditions during an exceptionally hot summer as far as the health of the workers is concerned?—No Most of my work is amongst the young persons and children. I have not so much experience of the older ones.

3232. (*Chairman.*) Just one point. You, of course, know that these spinners are necessarily more or less wet on account of the spray from the flyers?—Yes.

3233. Can you make any suggestion for protecting them?—I am afraid not I know personally they have a great objection to wearing those aprons that are provided for them They say they keep them warm. They have very little clothing on, and bare feet and low dresses

3234 (*Mr. Ewart.*) I am rather interested in that temperature of 101°?—I am not quite sure; it was a little over 100°.

3235. When you find one half-timer out of a dozen with a temperature between 100° and 101°, would it not suggest itself to you that that was due to something in the physical condition of the child rather than the condition of the room in which she works?—At first that was what occurred to me and I therefore examined the child very carefully and was able to exclude tuberculous or any other physical ailment. I made a complete physical examination of all the organs. The reason I took the temperatures was I was reading some work about healthy children—when they were taking physical exercise in the open air in hot whether, their bodily temperature rose: and this led me to take the temperatures up there. But the child was perfectly healthy as far as I can make out.

3236. Did you try other tests?—Yes, tests of heart and all.

3237. No sign of tuberculosis?—No, none whatever

3238. (*Professor Petavel.*) Was the temperature of all the children high?—No, two or three of them were normal.

3239 (*Chairman.*) I take it, when one talks of a comparison between a child taking healthy exercise and a child employed in a spinning room, the conditions are widely different?—Very different.

3240. Inasmuch as in our instance a child runs a race which lasts three or four minutes, or plays a game which lasts half an hour; whereas, in the other case, the child spends 10 hours a day at work?—Yes

3241. I suppose these conditions could hardly be compared?—No, they are quite different.

3242. Is there any suggestion you would like to make to the Committee with regard to the sanitary condition of those places that you visited?—You mean as regards the factories?

3243. Yes?—I am afraid I could not make any suggestion.

3244. I think your observations are to be made in both weaving sheds and spinning rooms?—Yes.

3245. We shall look to your report later on.

The witness withdrew.

Dr. William Burns called and examined.

3246. (*Chairman.*) Will you tell us your name and qualifications?—William Burns, Licentiate of the Royal College of Surgeons, Edinburgh and Glasgow, and D.P.H., Queen's University.

3247 What office do you hold?—Dispensary Medical Officer, Belfast Urban No. 15 I am Additional Medical Officer of Health for that particular district.

3248 In your official work are you in touch with the factory operatives?—Yes.

3249 Would you say that they are as a rule treated in the dispensary?—I would, in my district.

3250. (*Mr. Ewart.*) Where is your district?—It is between Grosvenor Road and the Falls. It is bounded by Leeson Street and goes right down to Cromac Street; but the bulk of my work lies between Grosvenor Road and the Falls.

3251. (*Chairman*) I think that district is very largely populated by factory operatives?—Yes.

3252. And I suppose most of them would probably come for medical attendance to the dispensary?—I think a great number of them; the majority.

3253 Have you any knowledge of the inside of the factories?—In the course of part of my duty I have gone through them—the Clonard and the New Northern

Mills. I only went to the New Northern because it was very convenient to go in, and I knew one of the men there; and I went to the Clonard.

3254. You have been through two?—The New Northern and the Clonard.

3255. Did you see the spinning rooms?—Yes, in both places.

3256. Have they weaving sheds also?—Yes.

3257. Spinning and weaving is carried on in both places?—I am not sure. At the New Northern both are. I am not sure about the weaving in the Clonard. It is principally spinning. I saw the weaving shed in the New Northern.

3258. Your visit was probably more or less of a casual nature?—Yes. I have a good deal of work to do, and just go in occasionally.

3259. You have been more than once?—Yes; I have gone round and examined the workers. Some have a good many old workers. I have gone and made an examination of the people working.

3260. Did that examination include both spinners and weavers?—Both.

3261. Have you formed any opinion from a sanitary or physiological point of view, as to the conditions under which these people work? First take the spinners?—That is only an opinion you want from me?

3262. Yes?—I want to keep clear of opinions. I want to keep down to facts. I could not give an opinion on that subject at all. I could give an impression, but I think a mental impression is not a right thing to give.

3263. I asked whether you had formed any opinion? If you have formed no opinion the answer is No?—I have formed an opinion about the thing at first blush, and on a closer examination I might be wrong; and therefore I came to the conclusion I had better not express an opinion unless I had some facts to go on.

3264. As a matter of fact we may take it you have formed no opinion on that point?—Well, I am not satisfied that I have sufficient grounds to express an opinion.

3265. My question was directed to the spinning mills. Does the same answer refer to weaving sheds?—Yes.

3266. Have you, from treatment of the workers or from examination of the workers in these places, been able to form any opinion as to the probable effects of their work on them?—Well, I can give you some facts, and I think probably these will be far more important than answering that question straight away; because a great deal hangs on the conditions under which the people live, apart from their work altogether. I mean, if you take one particular factor and say, "Can I trace "everything that these people suffer from to that?" you leave out all other factors.

3267. I think probably the answer to my question would be, that from that particular point of view you had not been able to form a definite opinion?—That would be probable; but I can give you certain facts, comparing different districts in the town.

3268. We will come to it?—I am not a theorist; I do not want to theorise; I only want to give you facts. I am not satisfied that I can connect the various illnesses that these people suffer from directly to their occupation.

3269. That is the answer to the question. I think you said you attended a great many of these workers?—Yes.

3270. Would you say that, as a rule, they compare in bodily health or in physique favourably or unfavourably with the rest of the population?—They are not of a very good physique. I would not say they were physically well developed.

3271. Have you been able to make any comparisons between them and any other workers?—I have been trying to do that by getting the occupational death rates; but unfortunately, for some reason or other, the Registrar-General gives these for Dublin but not for Belfast.

3272. As a matter of fact, we have no statistics showing the death rates of classified occupations?—No. I have been trying to get them, but it seems impossible; and I think that would be really more to the point than anything else. If you had that, you would have all the information you wanted.

3273. I see in your paper, which I have before me here, you attach considerable importance to food and housing conditions?—I do.

3274. Can you tell us anything about the food and the housing conditions of the population in your particular district?—I think the people do not take the proper kind of food. White bread and tea is the standard meal; whether it is from want of money—I do not think it is, probably—or want of education as to the kind of food they ought to take, I do not know. Then with regard to the housing, I think the density in my district is too great. It is 106 to the acre. I think that is a very important factor.

3275. (*Mr. Ewart.*) One hundred and six houses?—106 persons to the acre. For the whole of Belfast the density is about 26·3.

3276. (*Chairman.*) I see from the paper that you were good enough to send us you have a table of a number of cases of pulmonary tuberculosis?—Yes.*

3277. Perhaps you will hand it in, but we should like to hear your remarks on it?—I just classified the workers in my district that were treated in the years 1910 and 1911 with regard to their occupations. A large portion of those are spinners and weavers, but a fact you must take in conjunction with that is my district is largely a mill-working district. In addition to that, to give you a wider field, I took the Foster Green Extern Dispensary Department, and they had 700. Those 700 come from different parts of the city. It is not confined to one district, but from all parts of the city, and out of those 700 people there were 402 persons suffered from pulmonary tuberculosis, and out of that number I find there were only 72 mill workers. We had better take 72 out of the 700, because they were suffering from other ailments of the chest as well. There were only 72 out of the 700.

3278. (*Chairman.*) Seventy-two what?—People working in mills as spinners, weavers, winders, doffers, and reelers; only 72 out of 700.

3279. For one moment let us confine our attention to the first table. This is a number of cases of pulmonary tuberculosis treated by you in 1910, and their occupations?—Yes.

3280. These are the number of people actually treated?—Yes.

3281. What is the population of your district?—22,669 is the population of No. 15.

3282. (*Professor Petavel.*) How many of those are weavers?—Unfortunately the Registrar-General just gives the number for the whole city. There are 13,000 females. There are about 25,000 in the spinning and weaving, but I cannot get the number in my district.

3283. So you have really no indication whether the percentage of tuberculous persons is higher amongst the weavers than among any other occupation?—No; that cannot be deduced from this table.

3284. Except that the actual numbers are higher?—You could not draw any deduction from that at all unless I had the number of spinners and weavers working in my district, and the Registrar-General just gives the number for the entire city, female and male. I think it works out about 25,000 or so, spinning and weaving, and then there are the other departments of the linen trade, 30,000 altogether.

3285. (*Chairman.*) You see this table shows there were 29 spinners and nine weavers. Then we come to the next large number, 22 labourers. Now, of course we have not the least idea how many spinners or how many weavers there are in the district, nor how many labourers. Then we come to sailors. Well, there is only one here, but we do not know how many sailors there are?—I wrote to the Registrar-General, and I asked him for the occupations of the people. I know exactly what you want, but cannot get it.

3286. We perfectly understand your difficulty, and we recognise the trouble you have taken. At the same time we want to get on our Minutes the reason why we, in our Report, are not able to make any specific statement?—Well, I think that gives you a very good answer, that you cannot get a classification of these workers in the various districts.

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* *See* Appendix C.

3287. (*Professor Petavel.*) Without it, such a table is of diminished value?—I think it is not much good; but I give you all I can.

3288. Quite so?—I have the spinners and weavers here for the city. There are 2,736 male spinners, and 11,313 female spinners. Then the male weavers are 1,569, and the female weavers are 9,264; but I know, as a matter of fact, that an enormous number of spinners live in my district. Then District No. 3 has a considerable number. I have it down here for you. Also No. 5, which is just bordering on mine. So if you take from Shankhill Road to my district you have an enormous number of people engaged in the weaving and spinning.

3289. Would it be possible to obtain similar tables for all districts, and then compare them with the total population occupied in each trade? That would give the result we want, would it not?—I was wondering whether Table O which I have worked out, called the Age periods, would help you. I have worked out the death rates for the various districts in the town of those that are not engaged in the spinning and weaving, and those that are. I have taken not the ordinary death rates, which are very fallacious, but I have worked it out per thousand living at each age period. So if you listen to this classification you would get a kind of idea at any rate as to how the particular districts were affected.

3290. (*Chairman.*) For what district is this paper which you have before you?—I have worked it out for No. 12 Belfast, which is not a weaving district at all, and No. 3, which is between the Crumlin Road and Shankhill, and No. 5, which borders on mine, between Shankhill and the Falls and my own district. Those are the four districts, and also Belfast itself, worked out per thousand living at the different age periods. I thought that might be more useful to you than anything else I could do. I have worked it out for consumption and for other diseases.

3291. Would you be kind enough to tell us what the results are?—For Belfast the population is 386,947. Under 5 years the death rate was 45·67. Between 5 and 25 it is 4·45. Between 25 and 45 it is 9·8, and between 45 and 65 it is 28·33, and between 65 and upwards 73·8. That is Belfast. Now compare the various districts. Belfast Urban No. 12 has a population of 38,076. It is a working-class district, but with very few mill workers. That works out thus. Under 5 years of age 47·7. Between 5 and 25, 4·63; between 25 and 45, 11·37; between 45 and 65, 25·2, and between 65 and upwards 72·53. Now No. 3 has a population of 50,032, and is a mixed working-class district with a large number of mill workers. Under 5 years of age you have 48; between 5 and 25, 5; between 25 and 45, 9·5. Now I look on that as a most important age with regard to your industry, and it is really below the average of Belfast. Between 25 and 45 is the phthisical age, and between 45 and 65 is the bronchitis age. 9·5 in No. 3, and 9·8 in Belfast for the same period. Between 45 and 65 it is 28·5, which is a little above what it is for Belfast; 28·33 for Belfast—and 65 and upwards, 80·4.

3292. (*Mr. Ewart.*) Before you go on, Belfast 25 to 45—is that the whole of Belfast?—9·8. That is the death rate. That is for all diseases, only I am just showing the phthisical age is between 25 and 45. Urban No. 5 has a population of 16,112, and is largely a mill working-class district, and a poor district as well. Under 5 years of age you have 57; between 5 and 25, 5·69; between 25 and 45 you have 15·9 (of course that is a big jump up), and between 45 and 65 you have 39—also high—and between 65 and upwards 80·73. Now in Urban No. 15—that is my own district—the population is 22,669, and it is practically a mill working-class district. The death rate under 5 years of age is 72. That is very high, and that is where a great deal of my death rate comes in, under 5. 5 to 25, 5·14. Now between 25 and 45, 10·98. That is not very much above the Belfast rate. Of course here is where the big jump comes in, between 45 and 65, 49·1. I I think that is principally due to bronchitis. Then above 65 it is 65·9.

3293. (*Chairman.*) Just one moment. Bronchitis, I suppose, might be accelerated by dusty occupations?—Yes, there is no doubt about that.

3294. Just incidentally, may I ask if you have noticed any improvement in Belfast in late years on the dust question?—In some mills I have noticed a great difference. You get very little dust in some mills I have been through. You would not know there was any dust at all. Of course, the people may feel a little dryness in their throats, working all day long, but just going in you would not notice it. Another thing, to complete the Table. Death-rate for the city is 17·2, and the density is 26·3 persons to the acre. Urban No. 12, death-rate 17·2, density 36 people to the acre. Urban No. 3, death-rate 17·68, density 70 persons to the acre. Urban No. 5, death-rate 23·15—that is a jump—and the density is 112 persons to the acre. That is the greatest density there is in the city, and for No. 15 the death-rate is 23·38—a little higher—and the density is 106 persons to the acre. I think I had better give you the birth-rate, because the birth-rate is a very important factor as to what value the death-rates are. For Belfast the birth-rate is 28·4. For Urban No. 12 it is 35·5; for No. 3, 28·3; for No. 5, 31·9; and for No. 15, 28·9. Did you want to ask me any questions on that?

3295. Will you hand that in?—Yes. The only other thing I want to read, if you are satisfied about that, is the death-rate in Belfast for the various diseases per thousand for the persons living in the year 1911. For pneumonia the Belfast rate is 1·21. Urban No. 12, ·8. Urban No. 3, 1·98. Urban No. 5, 1·73, and Urban No. 15, 2. Liverpool, for the same disease, is 1·97. Other diseases of the respiratory system, Belfast, 2. Urban No. 12, 2·75. That is a district where there are no mills at all; I mean worth speaking of. There is only one mill. No. 3, 2·27. No. 5, 2·9, and No. 15, which is essentially a small district, is only 1·8. Liverpool, for the same disease is 2·2. Now pulmonary tuberculosis, for Belfast, is 2·07. Urban No. 12, 2·44. There are no mills in this district, as I told you. No. 3, 2·49. No. 5, 2·66, and No. 15, 3·17. You see there No. 15 is very high, 3·17; but I want you to compare that with Liverpool, which is 1·6 for the city, but in the Scotland Division it is 2·6, and in the Exchange Division it is 3·9. Now with regard to the Exchange Division of Liverpool, I wrote to Dr. Hope asking why there was such a high death-rate from pulmonary tuberculosis, and he told me that in his opinion it was due to poverty, overcrowding and excessive drinking; and he did not see that occupation had anything to do with it in this particular district. I thought that was interesting as regards the 3·9 rate.

3296. We shall consider all these statistics, in order to appreciate the particular points brought out?—Then there is this last thing, a list of the number of people treated. You see, there is very little difference between the summer months and the winter months in the attendance between 10 and 45.

3297. Are there any points which strike you which might with advantage be adopted for the better health of the workers?—I think if you could devise any means whereby you could reduce the temperature in the spinning rooms it certainly would be a help, if it could be done without interfering with the efficiency of the work. If it could be done, certainly it would be a help, I am sure. Of course, a great deal has been done. I remember in the early days there was a lot of water on the floor. You can scarcely see the water now. In any of the mills I have gone into there is always efficient drainage. Of course, they work in their bare feet, but still they like it. I have often asked these people about their work, and they like working in the spinning-room. If you ask a person, "*Well, do you like it, or would you rather work in some other place?*" she answers, "*No, I would rather work in the spinning-room.*" At least, I have heard no complaint. I come in contact with them, and if these were such desperate places to work in, I do not think they would be so keen on it.

3298. (*Professor Petavel.*) You give us this table of Belfast and the various districts. It would be very valuable to have your opinion as to the meaning of the general trend of these figures. Do you consider that they indicate that the mill districts contain a less healthy population than others?—Yes, I do, but for another different reason than you think. I think the density is a far more important thing than their occupation. That is my own opinion. I may be wrong. Take No. 5, the density is 112 persons to the acre, with small houses. I think it is far too dense. I think if you had more space for these people to breathe in when they come home it would be better.

3299. (*Chairman.*) Less overcrowding?—They are not overcrowded in each house. With regard to sanitary conditions generally we stand very well; but there are too many houses crushed together in the space. There is not enough air-space for 112 persons to the acre. That is really, in my humble opinion, the crux. I think if that could be effected you would have the mill districts just as healthy as any others.

3300. (*Professor Petavel.*) With regard to the table, do you consider that the division of the number of cases into hot and cold months throws very much light on the question of the effect of temperature and humidity as such, or do you think it may be affected by entirely outside causes?—Well, it is rather high for the summer. In that district there is very little difference between the winter and the summer. I would expect there would be more between the ages of 10 and 45 in the winter time, but it works out very differently. The figures for the summer months of July and August are higher than any of the winter months there. I do not know whether 1911 was a hot summer.

3301. Yes, it was?—They would undoubtedly feel it more working in an excessively hot atmosphere. Anyone would naturally say they were not the best conditions to work under; but my trouble is to get at facts to see what is the effect of this excessive heat.

3302. (*Chairman.*) That is the difficulty, of course?—I must say I think if you take No. 12 district where there are no mills and the same kind of working-class population, you get as high a death rate from phthisis than you would in No. 3. Between 45 and 65, of course, it is less, but between 25 and 45, 11·37, and when you come to a district like No. 3 you get 9·5.

3303. (*Professor Petavel.*) 15 in No. 5?—That is high, but No. 5, you must remember, is a poor district; and, of course, you have 112 persons to the acre. I believe if you had the people in No. 5 living under the same conditions as No. 12, with 36 people to the acre, you might have a different tale to tell with regard to the death rates.

The witness withdrew.

Mr. William E. Gordon called in and examined.

3304. (*Chairman.*) What position do you hold at Sion Mills?—Manager for Herdmans, Ltd.

3305. You do spinning only, I think?—Yes, spinning only.

3306. No weaving?—No.

3307. Approximately what counts are spun?—From 16's to 140's.

3308. How long have you occupied your present position?—About 12 years.

3309. In the spinning rooms have you from time to time experienced great heat?—Yes.

3310. I suppose on hot summer days?—Yes, it has been pretty hot.

3311. Do you suffer that way in the winter at all?—No, we do not.

3312. I think you have lately been trying to improve your ventilation?—Well, we have been experimenting.

3313. Have you two rooms?—Three rooms.

3314. Is my memory right when I say that in two there are plenum fans just blowing in the air to the rooms?—No, drawing out.

3315. How many fans are there?—There are two in the one room that you were in and three in the other.

3316. And these are drawing out fans?—Yes.

3317. Where there are two rooms how many frames have you?—In one of the rooms 32, and in the other 44.

3318. In the room where there are 44 frames, is that where there are two fans?—Three.

3319. Three fans where there are 44 frames?—Yes.

3320. And two?—Where there are 32.

3321. In the upper room you have lately put in a new plant?—We have.

3322. Is there anything of a singular nature about that plant?—No, there is nothing at all.

3323. Then the system as I understand is you are drawing out?—From below.

3324. From below the windows?—Yes.

3325. At least parallel with the lower windows?—Yes, from the bottom of the lower windows.

3326. And you have a screen to prevent a direct current, a draught?—Yes, that is so.

3327. And openings on the other side of the screen?—Yes.

3328. In this room how many frames have you?—44.

3329. And how many fans?—Three 24-inch fans.

3330. And they are exhausting from the room?—They are exhausting.

3331. Where are the inlets?—We inlet from the windows on the opposite side of the room.

3332. How long has this system been in existence?—Only within the last week.

3333. You had a few hot days last week, I think?—Not very warm.

3334. What is your impression as to its efficiency?—Well, I do not think there is much improvement, if any.

3335. What is the highest temperature to which you have got in that room as far as your memory can tell you?—About 83°, I think.

3336. That is, even on a hot summer's day?—Yes, 83° or 85°. I am not sure but I think that is about the height. It is very rarely that.

3337. Are your old fans still in that upper room?—They are, yes.

3338. Would it be feasible on some day to run, say for a few hours, on the old system and a few hours on the new and note the difference?—Yes, it would; but we are running a room above that on two fans and we had better results from the two top fans than we had from the three in the room below.

3339. (*Mr. Ewart.*) That is two fans exhausting?—Yes, two fans exhausting high up.

3340. Gave you better results than three fans?—They did.

3341. Were they all exhausting?—Yes.

3342. (*Chairman.*) Are all your rooms the same size?—The second and third rooms are the same size.

3343. Is one of them under the roof?—No, there is none under the roof. Our reeling room is under the roof.

3344. You are keeping a record, of course?—Yes, we are.

3345. And from that we shall be able to see if there is any improvement?—Yes.

3346. I understood from Mr. Herdman that he was very satisfied with the new system?—Well, it was only just started that morning. We did not know anything about it. We thought it would be an improvement. But I think the frames prevent you getting a proper outlet. It being up from the frames you cannot get a draw properly. I think it prevents the draught.

3347. Well, you will be able to let us know probably, in a short time the result of your experiment?—Yes, we could.

3348. However, you have managed by mechanical ventilation up to the present to keep a temperature in the spinning rooms which has not exceeded 83° even on the hottest days?—That is so. I am not quite certain, but I think 85° was the highest we had.

3349. And that, I take it, on very rare occasions?—Yes, very. I think that was in August, 1911.

3350. Now the floors are naturally wet?—Yes, they are.

3351. And you have waterproof aprons—rather light material?—Yes, they go right round the worker.

3352. They have bibs on them?—Yes.

3353. Have you difficulty in making the women wear the bib?—They will not wear the bibs.

3354. Have you ever tried splash guards?—Yes, we have.

3355. For how long did you have them on?—We have had them on two or three years. We had them put on 2¼-inch frames.

3356. Have you tried them on the other frames?—Yes, on some of the other frames.

3357. What was the result?—Well, we found that with a splash guard that was high enough to prevent any spray going over the top on to the floor the workers could not lay on the ends.

3358. I take it it prevented a good deal of the spray?—Yes, it did, a quantity.

3359. How long did they use them? I mean to say were the spinners given a fair opportunity?—Yes, we have four 2¼-inch frames, and we were obliged to put the guard down. We had to take about two inches off the top to allow them to work.

3360. That is the wide pitch?—Yes, 2¼-inch.

3361. Then you tried it on the other ones?—Yes, we tried it on the 2-inch frames.

3362. How long did the trial last?—About a fortnight. We tried different kinds.

3363. Have you seen any other spinning rooms in which there are splash guards?—Yes, I have.

3364. Whereabouts?—I saw one in Belfast here.

3365. How did the condition of the floor strike you in comparison?—I thought they were quite as wet as our own, and the manager of the place who took me to it said it was a splash guard of his own that he was showing.

3366. You thought the floor was as wet as your own?—I thought quite as wet.

3367. You have used mechanical fans for some time for ventilation?—Yes.

3368. Generally speaking—what is the average difference between the thermometers in your spinning rooms?—From two to four degrees. In very exceptional cases we have got six or seven, but that is not very often.

3369. Supposing that there was a difference of four, would you be able to carry on the spinning?—Yes, we would.

3370. Efficiently?—Yes.

3371. Is there any object in keeping the thermometers so close?—We find it difficult to have any more difference between the two.

3372. But still supposing you could get it down to six, would it injure your material?—I do not know. I do not believe it would.

3373. (*Mr. Ewart.*) When you tried those splash guards, were the spinning masters in favour of them or were they against them?—No, they did not seem to care.

3374. That is much the same thing. They did not go out of their way to try and make the hands use them?—Well, no, I do not suppose they did.

3375. (*Professor Petavel.*) Can you suggest any reason why the splash guards are disliked in your own mill? We have seen mills where both workers and managers think they are a great advantage and no inconvenience?—Well, we have not found that. We have found that there is a disadvantage in laying on ends. The workers do not seem to care about them at all. In fact, we have great difficulty at any time to get them to lay on properly, and when they have splash guards they say they cannot lay on at all.

3376. You cannot suggest any difference between your trade and the various mills we have seen where they lay on easily with splash guards?—The only thing is, there are very few people who do lay on ends; it is generally piecing. With us they are all laid on.

3377. (*Chairman.*) All laid on?—All with the exception of a few frames.

3378. (*Professor Petavel.*) Have you any views as to the temperature at which the water in the troughs should be kept?—No, I could not tell you that. It would depend upon the coarseness of the material. The coarser and harder your material, the hotter you would have to keep the troughs.

3379. You have not in your mind any temperatures that are specially suitable for given counts?—No, I have not.

3380. You say you are using splash guards on frames of 2¼-inch pitch?—Yes.

3381. Do the girls have any difficulty in laying on with those?—Yes, we had to cut those down from the height they were. We had to lower them. There were only four of them.

3382. Now that they are lowered are they efficient, do they prevent splashing?—No, they are not efficient. They are not high enough to be efficient.

3383. (*Mr. Ewart.*) You mean the splash comes over the top of them?—Yes.

3384. (*Chairman.*) Am I right in supposing that you have some system—I do not know whether it is patent or otherwise—for heating your troughs?—Yes, we have.

3385. Have you any objection to describing it? This will be published?—Well, I would rather not describe it.

3386. Would you tell us what it does?—It prevents the stirring up of dirt in the troughs. That is really the principal part of it.

3387. And it maintains the water at a certain temperature, the temperature you want?—Yes, it does.

3388. Can you work with any lower temperature?—Yes, with less steam.

3389. And consequently the room gets less heat?—Yes, you can work with any amount of steam on you wish.

3390. Is this in use anywhere else?—Only one place, I think.

3391. Then it is patented?—It is.

3392. Who has the patent? There is no objection to saying that?—We have the patent.

3393. Then if people wanted to use it you probably would want some royalty?—We would, yes.

3394. And do you find it appreciably lowers the temperature of the room?—Well, no, I would not say that. It was not really on that account we put it in. It was not on account of the heat we put it in.

3395. It was to keep your water cleaner?—It was to keep the water clean, and to keep the steam from disturbing the water.

3396. Have you the lip dip?—Yes, we have the dip.

3397. Then there is a little groove underneath for the warp to come along?—No, we have not. The lip is not quite close to the mouth of the trough.

3398. But are there separate little tubes?—No, we have not got that system. We tried one frame with it, but we took it out again.

3399. (*Mr. Cummins.*) Do you think if the splash-board was a little more aslant, it would be better?—Well, it would be a benefit, without doubt.

3400. Of course, it would give less room between the frames?—Yes, but with us that is not much of a question. We have plenty of room.

3401. (*Mr. Ewart.*) Did I understand you to say that with this patent way of heating the troughs you were able to use cooler water—you were able to work the troughs at a lower temperature?—No, that is not the case.

3402. (*Chairman.*) I gathered that was the answer I got. I could not have understood.

3403. (*Mr. Ewart.*) Yes. Could a fixed temperature be laid down by law specifying that you could not have your trough-water above some fixed temperature, say 90 degrees, for flax spinning?—Well, I do not see how that could be followed at all, because it would depend upon the counts, and it would depend upon the year's flax. Sometimes we have to keep our troughs much hotter for one season's flax than for another season's.

3404. Am I right in saying that a careful spinning-master settles the temperature of the trough by the quality of his spin?—That is quite right.

3405. If he sees his yarn beading?—Yes, he makes his water warmer.

3406. That is about the limit?—Yes.

3407. To spin it without bead?—Yes, that is the limit.

3408. (*Chairman.*) Are there any suggestions you would like to make to the Committee?—I do not know of anything.

3409. You know what our object is? Our object is to try to keep the temperatures of the rooms down?—Yes, I know.

3410. Is there any suggestion on that point you could give us?—I do not know of anything.

The witness withdrew.

Captain Ambrose Ricardo called and examined.

3411. (*Chairman.*) I think you are one of the directors of Herdmans, Limited, Sion Mills?—Yes.

3412. May we ask how many years' experience you have had in flax spinning?—Ten years.

3413. We have had Mr. Gordon here, and he has told us exactly the nature of the work done and the conditions under which the work is carried on. Have you given any attention from time to time to the ventilation of your spinning rooms?—Yes, we have, and we are working at them now. We are trying the plan of putting the fans lower down, nearer the floor level. We have not gone quite far enough to express an opinion.

3414. We saw that and the last witness told us something about it: but I gather you are not in a position yet to give any definite opinion as to whether it is superior to the methods you had before?—No, we are not.

3415. I suggested to the last witness that it might be well to make comparisons between the two rooms—there are two rooms, I understand, that are practically the same except as regards the methods of ventilation—and see what the results are?—We can do even better than that because we have left the old system of fans in the same room. So we can turn on the fans at the low level, or stop them and turn on the fans we had before.

3416. It would be very instructive to us, if you can get the conditions pretty much the same?—That I intend to do.

3417. And let us have the result of that?—I will certainly, because it is not quite fair to compare different rooms as the difference between the wet and dry bulb temperatures is not always the same in the three rooms.

3418. (*Professor Petavel.*) You would be willing to let us experiment with that set of fans?—We should be only too pleased, yes. I may say Mr. Garrett Campbell was speaking to me personally about it. They have got them all, I understand, at low level, and he sent us some particulars.

3419. (*Chairman.*) I think it might be as well to ask Mr. Campbell his experience of that system. They maintain a perpetual difference of four degrees?—Yes, I understand.

3420. Can you tell us what is about the highest temperature reached on very hot summer days?—I am afraid I could not tell you that. It varies very much. Our experience is it depends almost entirely on the atmospheric conditions. I think on the day you were there there was a very large difference, but it was a very bright clear day.

3421. We looked at the records and our recollection is that you managed by mechanical ventilation to keep the temperature down even on the hotest days to somewhere very little above 80°?—Yes, that is about right. We should consider them very hot if they were over 80°.

3422. From a practical point of view have you found it necessary for efficient spinning to maintain any particular difference between the readings of the two thermometers?—No, I do not think so.

3423. I am coming to the old question of splash guards which I think I debated with you a great many years ago?—Yes.

3424. I have seen a great deal since then and heard a great deal of evidence, but still I must ask you what you think about the splash guard question, in the first place whether it would make the room drier, and in the second place whether it would interfere seriously with the work?—Well, sir, of course you have had pointed out to you that we "lay on" all our yarns, and to sum it up I think if you had a splash guard of sufficient height to prevent the spray or most of the spray going on the ground then I think it would interfere with the worker. If you have the splash guard so low that the worker can "lay on" the yarn with the wrist quite unimpeded, then I think they are not efficient from what I might call your point of view.

3425. You have some coarse frames?—Yes, 2¾-inch pitch. As far as I can recollect we put those splash guards on with measurements that Mr. Williams gave us. In fact Mr. Gordon was talking to me and I told him I thought that the measurements were actually laid down in the regulations, but you pointed out to him they were not, but they were certainly the measurements given by Mr. Williams. We found our workers could not work with them at that height, and we had to take them off and cut them down.

3426. Supposing you were to take those guards off for a few hours to-day what would be the condition of the floor under those particular frames?—Well, as far as you can see there is practically no difference in the floors where the splash guards are and where they are not. I think the reason really is this. Yesterday was a very sunny day and looking along where you could see the spraying going on there was any amount of spray going over the top of the splash guard. There was as much spray going over the top of the splash guard as there was being caught.

3427. But it reduced it?—It reduced it certainly.

3428. You have some very light oilkskin aprons for your workers?—Yes.

3429. With bibs?—They have bibs on but wild horses would not make them put them up. Of course they ought to.

3430. According to law they ought to, but as a matter of fact they do not?—No, they do not. Possibly Mr Gordon explained to you our great fight with our spinners is on this question of laying on and piecing. Mr. Herdman examines the yarns regularly and if he finds a piecing it goes back to the frame, and if that occurs again there will be trouble. We think if we give them the slightest excuse the fight will be increased.

3431. The law as at present laid down is this, that the occupiers will provide and the workers shall wear aprons of suitable material?—Yes.

3432. It does not say waterproof?—No.

3433. Without anticipating what report the Committee may make (we certainly have not made up our minds yet by a very long way) supposing an alternative were thought of, the alternative to be that they shall wear something which will protect the upper part of the body from getting wet, is there anything you could suggest?—Well, I do not think you could have anything better than the bibs that are on the aprons. Why they will not put them up I cannot tell you.

3434. The alleged reason generally is that the india-rubber being waterproof is waterproof on both sides—that the perspiration cannot evaporate and it makes the chest so hot?—I would not have thought they were large enough for that.

3435. Well, I do not think so, but that is the excuse that is always made?—Yes

3436. The law is they shall be worn, or, failing that, that the occupier shall put on splash guards, and as a matter of fact in half the places, or you might say more than half, practically all over the north of Ireland, the law is being broken?—Yes.

3437. The bibs are not worn and the splash guards are not on?—I think if they found they got very wet above the waist they would put them up. A girl does not get wet there until she leans over to do something to the creel.

3438. That is when they get it, I fancy?—Yes. Of course, we have a large turn off, and we have fewer broken ends than most places.

3439. About how many workers have you in your works?—1,200 about, in the whole works.

3440. If it is fair to ask the question, about what average wages would the spinners make?—12s. It has just been raised.

3441. (*Chairman.*) Is that day-work?—Yes.

3442. For a full week's work?—That is a spinner's wage, of course, not a reeler's or other worker's.

3443. It has been suggested to us by medical men and others that apart from all questions of the risks of the industry, the question of having plenty of food and good fresh air and so on comes in very largely?—Yes.

3444. We know your workers have plenty of fresh air?—Yes.

3445. Say a woman is making 12s., would that be a woman who has perhaps a husband working and children working?—Yes, or a father or sisters.

3446. Are there cases where a woman has a family to bring up on the 12s.?—Very rarely. Sometimes a woman is left a widow and comes to us and says she would like us to take her family. We would not have a woman who would have only 12s. coming in if she had to support herself and a family on that wage. But if she has one child on full time and another on half time, we would take that family then.

3447. When 12s is spoken of as being the wage, and the question is raised whether 12s is a living wage, the answer would be, there are several people who put in the pool?—It is a living wage. Look at the agricultural labourer. The agricultural labourer round us at the outside gets 13s. and has to keep a family on it. Of course our rents are low.

3448. (*Professor Petavel.*) I think I asked the previous witness the same question. Can you suggest any difference between your trade, in which apparently the splash guards are difficult to use, and the trade carried on in quite a number of mills where both workers and managers use them and think them an advantage?—Well, there is no doubt our trade is a very special trade. I mean to say that there are very few other places spin exactly the same class of yarn that we do.

3449. What would be the difference?—Well, I think we have the credit of spinning the best warp yarns there are; that is to say, yarns in which no piecings will be accepted. Supposing we supplied a manufacturer with yarn with piecing he would send the yarn back to us. He would say, "I do not pay "you this very high price for yarn like that."

3450. Yes, but on the frames I am referring to? We have seen the process of laying on carried out efficiently with splash guards in position. You cannot suggest any reason for the difference?—I cannot. I know one place you may be alluding to at Kilbirnie. They spin the highest class of yarn in Scotland. I understand they use splash guards too, but they do not spin yarns for the market; they spin yarns for their own consumption.

3451. How does that affect the question?—Because we have to sell the yarn in competition, say, with a firm like Lindsay Thompson, or some other firm like that, and I think our customers are probably more particular.

3452. For what purpose do they use their own yarn?—For making thread, and they may have methods (I cannot tell you that) of slubbing their yarn. They probably have.

3453. Do you not think the workers if trained for some weeks would acquire a facility for laying on with the splash guards?—They might. I think that depends a good deal on the stature of the spinner. A tall girl can naturally get her hands down easier than a short girl can.

3454. So the difficulty might be got over by training?—No. I do not think I could say yes to that. At least that is our belief. We are guided also by the experience of our overlookers who have overlooked in many different types of places. That is their opinion.

3455. Do your spinners suffer from results of the moisture?—No, we think they do not. I gave some statistics about the health of our spinners, which I may say rather surprised me. Ask any old woman in our village and she will tell you that if she started again it is the spinning room she would go to. If you hear any complaint at all it is the dust you hear mentioned, nothing about the heat of the room.

3456. (*Chairman.*) You have done away with that now, have you not?—We have tried to.

3457. I think you have, have you not?—We have done a great deal lately. Did you see the exhaust over our spreading boards? We have just put them in lately. They are a great success.

3458. Is there anything more you would like to say?—These figures refer to our village only (*referring to table*). We could not go outside.

3459. Spinners seem to be about the lowest?—Yes. Then of course we took the broken time for that particular six months. Of course a broken time includes every case. We have our own dispensary and of course our own doctor, and we investigated the question of the number of lines. The lines are given by the overlookers. We could not give any test there, because with lines given to women we do not know whether it was for herself or her baby or some member of her family. We had to abandon that question.

The witness withdrew.

Mr. WILLIAM JOHN McDOWELL called and examined.

3460. (*Chairman.*) You are Secretary to the Power Loom Tenters' Association?—Yes, the Power Loom Tenters' Trade Union.

3461. Is that Association a Trade Union?—It is.

3462. Are your members both men and women?—No, all men.

3463. Have you any objection to telling us the number of your members?—About 440. That is in the Trade Union itself.

3464. How long has this Union been formed?—Since about 1877.

3465. Are weavers included amongst the members?—No, they are all power-loom tenters.

(*Mr Ewart.*) A tenter here is what is called an overlooker or tackler in Lancashire.

(*Chairman.*) When I heard so many members I did not realise there would be so many other tenters here.

3466. (*Secretary.*) Your Association embraces more places than Belfast?—Yes, it embraces Cork and Limavady.

3467. (*Chairman.*) Will you tell us exactly the duties of the tenter?—First of all he is in charge of a certain number of weavers, and he has a certain number of looms under his control. His duty is to attend to those looms, keep the weavers at their work, see they do their work properly and also to adjust anything that may go wrong in the loom. He is responsible in fact for all the production as far as the cloth is concerned, and also for keeping the machinery in proper working order.

3468. Have all or any of the tenters had practical experience as weavers?—Yes, a number of them. Most firms would prefer a boy who had been weaving for a year or two before going to a tenter, because it would considerably assist him in his duty.

3469. May I ask if you have had practical experience as a weaver?—Both power and hand-loom weaver, also power-loom tenter.

3470. All in linen factories?—Yes.

3471. You have never been in a cotton mill?—No. Of course we have a mixture; sometimes both classes.

3472. What firm are you with now?—I am not working in any at present. I am General Secretary of the Trade Union.

3473. And I have no doubt that takes up the whole of your time?—Yes.

3474. What experience have you had in exercising your profession as tenter?—The last place I was working in was Smithfield. About four years ago I left Smithfield I was in the York Street Weaving Factory. I served my time in the York Street Weaving Factory. I was there about 12 years ago. Also in the Brookfield Linen Weaving Factory and in Linfield.

3475. Would you mind telling us the classes of goods they manufactured in the different places where you worked?—I have had all classes manufactured in Belfast except damask. I have had experience in damask, but not to any extent. That is both fine linen and fine cotton, drills, checks, hocks and dobby works.

3476. And cambrics?—And cambrics.

3477. You probably know the object of this enquiry. I daresay you have seen one of the explanatory memoranda, have you?—Yes.

3478. And you know that we are enquiring how far the health of the workers is affected by high temperatures and moisture. Are you able to express any opinion as to whether the workers suffer from the high temperatures and the moisture combined?—I suppose that would be a question perhaps more for the medical profession than myself, as far as that is concerned, but I can assist you in reference to our Trade Union—that is, the way that it affects the general health of the tenter; and I suppose it may apply to the worker generally in the weaving factory. I went to the trouble of taking figures out for about nine or 10 years, and I will just give you the figures. You may take it they are perfectly accurate. They are from the year 1902 to 1911. The reason they were taken out at that particular time by myself was in reference to the Insurance Act. I was going over the country at that particular time talking about the Insurance Act, and I was trying to compare the Insurance Act with our own work, our medical benefit. This is in pence per week. Our medical benefit cost us for 9 years 0·8 of a penny per week per member. Our sickness benefit only cost us 1·28 of a penny per week per member.

3479. That is sickness?—Yes, unable to follow his employment through sickness. Our trade union provides that if a man is out sick he gets a certain amount of sick payment during the whole of the time he is out from his employment, and on the death we pay death benefit too. It only costs us 0·8 of a penny per week, which is not more than 1 per cent. during 9 years. As far as our membership is concerned, of course, that takes in all classes, both damask, plain and fancy—the trade in general.

3480. What you have given us is the summary for those years?—The summary for those years.

3481. That does not appear as if the people suffer very much?—Well, so far as my experience in connection with the society is concerned (I say it is more for professional medical men than myself) with reference to the amount of money we have had to pay out owing to health, I think you will agree it is not very excessive.

3482. Putting aside for a moment the question of actual injury to health, on the very hot days in the summer do the workers suffer any great bodily discomfort at their work?—Well, perhaps it would be difficult for me to explain myself, but, for instance, suppose you have a temperature of 80° on the dry bulb thermometer, and supposing the wet bulb thermometer is, say, 75° or 76°, that is, the atmospheric conditions are such that we cannot possibly get the two bulbs within two-and-a half degrees of each other; I have found under those circumstances it is very difficult and trying for the worker in general, because then the atmosphere is in such a condition and there is such a deteriorating effect upon the yarns that the worker has twice as much, if not more, work to do than what she would do if we were able to keep the wet and dry bulb thermometers within the two degrees, and I have found that where we can possibly manage that, it is not so laborious and difficult so far as the tenter is concerned.

3483. With a difference, of course, of four or five degrees, one would anticipate that there would be greater comfort for the worker?—Yes.

3484. But you say that is done away with on account of the extra work?—The extra work; because you find in cases like that, sometimes a man may be in such a condition that he feels almost like running out ready for bursting in such a heat; but when there is a certain amount of moisture and there is not so great a difference between the two bulbs, the moisture seems to have a soothing effect both on himself and, of course, on the yarn, and certainly creates less labour.

3485. Of course, I take it as your view, and you have formed your own opinion, but it is opposed to all scientific evidence and all the evidence of the cotton operatives throughout Lancashire. Has it struck you that with a difference such as you describe, four or five degrees, perspiration will be much more easy; that the sweat on the body and neck and hands will evaporate?—I have heard that said, but from actual experience I do not agree with it.

3486. What would you say is the minimum difference between the wet and dry bulb thermometers for efficient weaving for medium and fine counts?—I would say it should not be more than 2½° at the very outside.

3487. (*Mr. Ewart.*) When you spoke of certain figures of sickness benefit, was that the sum actually paid out, or did that include the cost of working the society?—No, the actual cost of the sick benefit.

3488. Not the cost of working it?—Not the administration expenses, no—the actual sick benefit.

3489. (*Professor Petavel.*) Do you find you get many complaints when the temperature and humidity are both high in summer?—The greatest complaint I have ever heard in a weaving factory is not so much the high temperature as the atmosphere producing bad weaving—generally more complaints in reference to that.

3490. We have had it stated here that in certain places, owing to carelessness or misjudgment in the use of the humidifying apparatus, the humidity is carried to an excess even above what is required for the best condition of the cloth. Has any condition like that come to your notice?—I say that may be possible, but so far as my experience goes in any weaving factory in which I have been that is not so, but it may occur through careless overlookers not looking work right.

3491. It would be unusual?—Very.

3492. Have you any actual experience of weaving in less humidity than allowed by the Act?—I have.

3493. What is your impression of the result?—I have been in particular shops where no steam is required at all as far as actual work is concerned, but even there I have found my own actual condition was I would rather work in the humid atmosphere, because there was a certain amount of fluff from these particular yarns that you were inhaling all the time, and which created not a very pleasant sensation about your chest; whereas if you were using humidity it was all taken to the ground, and you did not inhale it.

3494. Is the same amount of humidity necessary for both coarse and fine work?—Not to the same extent. In coarse work humidity is not required to the same extent as in what you might call a medium or fine shop.

3495. From nine hundreds up?—Yes, from eight or nine hundreds.

3496. (*Chairman.*) Have you had any experience at all of cotton mills?—I have never been inside a real cotton mill where they work nothing else; but I have had experience of working cotton here in amongst the linen.

3497 I want to ask if you can account for what seems a difficult problem. Have you read the Report of the Committee on Humidity in Cotton Weaving Sheds?—No, I cannot say that I have

3498. Have you heard that there was a ballot taken of the cotton weavers in Lancashire on the humidity question?—Yes, I think I did hear of it, but I would not be exactly sure.

3499. The result, I may tell you, was that 60,000 against about 3,000 were strongly of opinion that any humidity injured their health seriously, and so much so that at one time they threatened to come out all through Lancashire if there was any humidity. Now that is the opinion of 60,000 weavers who are working in a humid atmosphere. You tell us over here that the workers rather want more than less humidity; that, for instance, when there is a difference between the thermometers of four or five degrees they like it less than when there is a difference of two. Can you account for that in any way?—Of course it is easier to the worker as far as the web is concerned, because she has not so much yarn to draw.

3500. You account for it by her having less work? —She has less work.

3501. (*Mr. Ewart*) Have you in your experience had many complaints from weavers of too much moisture?—No, I cannot say very much. You go to a weaver who may be working at a pair of looms here, and the steam jet is a little bit over her, and she may complain that she would rather have the steam jet turned off a bit. You go to the weaver on the other side of her, and she will object very strongly and tell you she cannot weave because the yarn is breaking out.

3502. Is it not a fact that they try to remedy the dryness of the air themselves by carrying water?—Oh, they do. I have done it myself. After the engine has stopped at night I have carried water perhaps for half an hour to throw it over the floor for the purpose of creating humidity. Even in the daytime I have done that, and the weavers do it themselves. When they go out for a drink or anything they will bring water back with them and throw it on the floor.

3503. (*Mr. Cummins.*) This girl that wants the steam turned off is getting too much, and the other one not getting enough; is not that it?—I will not say that.

3504. With regard to the figures you have given for sickness, some tenters are paid a commission—the majority of them?—About half and half.

3505. When those tenters are out sick is not it a fact that in a good many of the places the other tenters keep his share going?—Not so much now as what used to be at a prior date. They generally send a spare man, or in some places where there are a number of tenters they put two or three apprentices on the share. If the man is away any extended time they generally bring up a spell man

3506. And yet that man's wages are going on all the time; he gets his wages?—No, he does not In perhaps an isolated case there is a good employer who does that

3507. (*Mr. Ewart.*) What he means is the wages go on and it is divided amongst those who do the work?—Yes You cannot expect a man to do the work for nothing.

3508 (*Mr Cummins.*) No, I mean the man that is out sick gets his wages?—It may be done like that occasionally, but I know I have often to send a man away for the purpose of filling a position. I have five or six men working on spell just at the moment with men being out sick Some of the firms where they have no apprentices, if a man merely goes out for a day I have to send a man down to take his place, and they certainly will not pay two men. It really makes no difference to the society when the tenter is paid by the employer, in all cases of sickness he claims from the society, and consequently does not affect the figures given.

3509. (*Chairman*) I gather you would not welcome any reduction in the amount of moisture that you are allowed by law at present?—Well, of course I understand, sir, the best weaving atmosphere of the factory will be perhaps 72° or 73°, and of course if you could keep two or two-and-a-half degrees difference between the bulbs I think it would be a boon to everybody.

3510. I was going to ask, first of all, you fix a limit at from two to two-and-a-half degrees?—Yes.

3511. Would you welcome any reduction in temperature?—Decidedly.

3512. Decidedly you would?—*Yes*, but not below that.

3513. Not below what?—Not below about 73°.

3514 But supposing that by mechanical or other means you could in summer reduce the temperature by a considerable number of degrees, would that be a welcome thing to the operative?—I think it would.

The witness withdrew.

NINTH DAY.

Saturday, 11th October, 1913.

At Belfast.

PRESENT:

COMMANDER SIR HAMILTON FREER-SMITH, R.N., C.S.I. (*Chairman*).

Mr. Henry Cummins.	Professor J. E. Petavel, F.R.S.
Mr. Herbert Ewart.	Professor Lorrain Smith, F.R.S.

Mr D. R Wilson (*Secretary*).

Prof. Leonard Hill, F.R.S., called and examined.

3515. (*Chairman.*) Will you please state your qualifications?—M.B., F.R.S., Professor of Physiology, London University

3516. I have not any written statement on which to ask you questions, but I propose to ask you a few questions, and then, perhaps, you will be kind enough to make any statement that you think would be desirable You have given a considerable amount of attention at one time or another to the physiological effects of working in hot moist atmospheres?—Yes

3517. And have you seen any of the Belfast mills? Yes, I went over some with Mr. Wilson.

3518. How many mills did you visit?—Seven I have notes here of seven mills.

3519. Were these both spinning and weaving?—Spinning and weaving, yes.

3520. How many of each kind?—I have notes of observations taken in four weaving sheds and five spinning rooms.

3521. Of course, we can hardly expect that from casual observation you would come to any very direct conclusions; but did you form any general opinion as to what would be the probable physiological effect of work in these places? Taking first the spinning rooms?—Well, the observations I made show a very striking difference between the conditions which pertain in these sheds and the conditions of an ordinary place of business—the ordinary conditions of workrooms and offices; still more from conditions which pertain out of doors on what we should call an ideal summer or spring day. You see, what I came over to do was to investigate these sheds with a new instrument, and I am simply basing what I have to say on the results which I obtained with this instrument. I should like to show the committee that instrument; some of them might not have seen it.

3522. Perhaps it would be well if we came at once to that. You have invented a new instrument called a kata-thermometer, I think?—Yes.

3523. I take it, with that instrument you arrived at the amount of moisture in the sheds?—Well, what I was particularly studying was the rate of heat loss. The instrument enables one to get an idea of the rate of heat lost, which I take it is the essential thing in regard to the human body. A wet bulb and a dry bulb do not tell one anything like the whole story; and often they do not tell the story at all

3524. Would you, in your own words, just describe this instrument?—Yes, and at the same time I might show it to the committee. (*Instrument produced.*) It consists of two large bulbed spirit thermometers. The bulb of one has a finger stall of a lace glove placed on it so as to convert it into a wet bulb instrument; the other is a dry bulb instrument. Heavy marks are placed upon the stem at 110° Fahrenheit, 100° Fahrenheit and 90° Fahrenheit The instruments are placed in warm water at a temperature just about too hot to bear your hand in, and are kept in that until the spirit rises up into the bulbs. Then they are taken out, and the dry one is rapidly dried with a soft cloth, and from the wet one the excess of moisture is jerked off by one or two jerks and then they are placed in the box in this way so as to be suspended in air, and with a stop watch the time is taken that it takes for the meniscus to fall in each instrument from 110° to 100°, and another reading can be taken if necessary from 100° to 90°. That gives one the rate of cooling of the instrument at approximately body temperature, the one being a dry bulb instrument losing heat by radiation and convection, the other, a wet bulb instrument, losing heat mainly by evaporation. The instrument is empirically graduated by taking readings on summer or spring days out of doors—conditions which all of us would say were ideal—or indoors with windows open on these ideal days; conditions, I mean, which we all consider comfortable, where there is a warm sun and a nice cool gentle breeze blowing, and where there is no feeling of chilliness or stuffiness, but perfect comfort. Then I compare the readings taken under those conditions with the readings taken under conditions such as obtain in these mills.

3525 And what deductions do you draw from that as applied to the human system? I mean would you consider the body to be a wet bulb thermometer?—The body is losing heat by radiation and convection and by evaporation, and this dry instrument is losing heat by radiation and convection, and this wet instrument is losing heat by evaporation. So one gets some idea as to the rate of heat loss. What the kata-thermometer particularly shows is the effect of movement of the air, which the ordinary wet and dry bulb thermometer does not show.

3526. I have not yet got the connection between that and the human system quite clear—beyond, as I suggested, that the body is really to some extent a wet bulb thermometer?—Well, what one finds in using the instrument is this Supposing one gets readings of this instrument when the conditions are perfectly comfortable, on an ideal day. If the conditions are made in a room so that the instruments lose heat at about the same rate as on that ideal day, then those conditions are comfortable and healthful; but if it is very different, if the instruments lose heat at a very much slower rate, then there is discomfort. The graduation is purely empirical.

3527. The instrument actually could be used to aim at producing comfortable conditions of atmosphere?—Yes, that is what I claim for it It helps one to find whether the conditions are comfortable One sees the value of the instrument very clearly in observations which I have been taking recently in a house situated on a cliff on the East Coast, near Yarmouth. Indoors, in an ordinary sitting-room facing the sea, with the window and door shut, the wet bulb—to give you an example—was 59°, and the dry bulb was 62°. The wet kata thermometer fell from 110° to 100° in 50 seconds, and the dry fell in 137 seconds. It was a bright, sunny day, with a gentle breeze blowing On moving outside, the wet bulb was 61° and the dry bulb was 64° The wet kata-thermometer fell in 26 seconds and the dry in 61 seconds. That is, the dry fell in 137 seconds indoors and in 61 seconds on moving outside. The wet and dry bulb thermometers did not show the cooling effect which the body felt, for the wet and dry bulbs were higher outside. The body is cooled by the moving air outside, and one can measure the tremendous effect of being outside in this moving air, the invigorating feeling, which is not indicated by the ordinary thermometers at all, but this instrument does show it

3528. I think you attach considerable importance to having a movement of air?—Yes

3529 You know the condition of the weaving sheds and the spinning rooms in Belfast?—Yes

3530 You probably know that for good weaving it is necessary that the atmosphere should contain a certain amount of moisture?—Yes.

3531. Assuming that that condition has been reached, and that you cannot introduce any more air from outside, without spoiling the weaving, do you think, then, that any artificial movement of the air would render the place more comfortable and more healthy to the workers?—Yes, I think it would, very greatly.

3532. Even although the condition of the atmosphere might not be altered?—Yes; I have evidence to show that the movement of the air has a very great effect although the wet and dry bulbs remained unaltered.

3533. And the composition of the air not altered as regards the proportion of carbonic acid?—No, not at all altered in any chemical way; but simply moved

3534. I think you said you have evidence to show that that makes a very great difference?—Yes.

3535. Would you kindly just give us your views on that point?—Well, first of all I would just like to give you the kata-thermometer readings which I obtained in these weaving sheds and spinning rooms contrasted with the sea side figures, an example of which I gave you just now. In the spinning rooms the times were something like 60 seconds for the wet kata-thermometer and 200 to 230 seconds—sometimes as high as 266 and sometimes as low as 180 in the better rooms—for the dry kata-thermometer, as against something like 50 seconds and 135 seconds indoors at the sea side, and 25 seconds and 60 seconds out-of-doors on a nice, sunny, bracing day. In the weaving sheds it is something like 200 seconds against, say, 60 seconds on a nice day on the cliff—something like that.

3536 That is the rate of cooling?—The rate of cooling of this dry kata-thermometer.

3537. Will you explain how the rate of cooling actually affects the body?—Well, the movement of the air cools the body by carrying away the air which is heated. I mean, if the air is stagnant one gets a blanket of air entangled in ones clothes round one, that gets warmed up to body temperature and gets saturated with water vapour. If it is entangled in the clothes it does not move away freely; but if there is a current of air which is carrying away that blanket and bringing cooler air which is not warmed up to body temperature (even although the air is at 80° or 85° wet bulb, for there is a very big difference in saturation between 85° and body temperature, 98°), that air can take up a great deal of water, and if it is moving rapidly past the body it is having a very great cooling effect.

3538. Without it, free perspiration is not going on?—Free perspiration is checked because of this blanket of air that is entangled in the clothes and surrounds the body.

3539. You have, I think, seen both spinning rooms and weaving sheds, and you will have noticed, of course, that there is a lot of moving machinery?—Yes, that is a very important point, I think. That movement of air makes a very great difference.

3540. After your visits to these places are you able to form any opinion as to whether that circulation would be sufficient for the purpose you have in view, or would you recommend any artificial method of circulating the air?—I think that that movement which now exists in all these sheds makes that air supportable which would not be supportable—or which would be far less supportable, I mean, if it were not for all these moving wheels and spindles.

3541. Would you consider, for instance, that some fans—say, placed on a revolving shaft, or on any movable part of the machinery—might add to the comfort?—I think it would, very greatly indeed; and the fans might be placed so as to blow on the operatives without interfering—supposing it did interfere—with the thread. I mean considering the elasticity of air, and the way it pockets and gets into strata, and so on, one can blow upon a person without necessarily blowing very much upon the threads which are being spun—if the air is rightly directed. I do not know, sir—no doubt you will know—whether actually moving that air which is in a shed which is at the right degree of humidity does affect the spinning.

3542. I do not know whether anybody can speak with very great certainty on the point?—I found even taking readings two yards from the spindles in a spinning room, in a warm corner where the wet bulb was 82° and the dry bulb 86°, the wet kata-thermometer fell in 71 seconds and the dry in 266 seconds—two yards away from the spindles. On placing it nine inches from the spindles, where a woman was moving up and down, and all these spindles were blowing upon her and cooling the air, the wet one fell in 53 seconds and the dry one in 226 seconds. Small differences in readings are not worth anything—I mean if you take a succession of readings they may vary five or ten seconds; but there is enough difference between 266 and 226 to be significant, and the conclusion I make is corroborated by other readings I have got. For example, the dry kata-thermometer fell in 175 seconds. So even the movement of all those little spindles turning round is having a cooling effect which is good for the operative walking up and down close to them. Then when the engines are stopped there is a noticeable difference. The engines were stopped running and the wet bulb was 82° and the dry 88°. In a few minutes' time the readings went up to 82·5° the wet, and 88·5° the dry; but the dry kata-thermometer now fell in 302 seconds—a great increase. Of course these readings are limited in number. I should like them further corroborated; further readings taken; but I think I have quite enough evidence to show that the movement in the sheds does affect the rate of cooling; if one holds the kata-thermometers up near the driving wheels, or gets near any big wheel that is turning, one finds a shorter time. Here is a reading taken in the middle of a stand—the dry kata-thermometer fell in 193 seconds. Held up near the moving wheels it fell in 158 seconds. In a central walk, the further end from the door in this shed, the reading was 203 seconds for the dry kata-thermometer. In the central walk at the door end, and close to the driving wheel, the reading was 146 seconds. So you can get big differences in these sheds in various places—therefore operatives are not equally being affected by the temperature; and the wet and dry bulb thermometers placed in the middle of the sheds are not registering or showing those differences.*

3543. I think on this particular point we may take it you are of opinion that if you can circulate the air it will improve the working conditions for the people who work?—Yes, I would urge that very strongly, and I think one of the great benefits of the movement in those sheds is that it is a very varied movement, it is not a monotonous movement. In the House of Commons, which I am now investigating, they have a monotonous current coming up through the floor, always in one direction, and always cooling the trousers and feet. Another set of readings I have taken with the kata-thermometers are these. I enclose them in a little wire cage and slip them under the shirt and take readings under the clothes. I have taken readings with some of these operatives. I have taken readings at the seaside upon ourselves, and taken readings in an experimental chamber. The first was at the sea-side, sitting either indoors or out-of-doors on the cliff with just a cotton shirt, and one's coat thrown open, and a kata-thermometer put under that. Out of doors there was a bracing wind, but one could sit out of doors in the sun without feeling over-chilled, and enjoy it. I took the "skin-shirt" readings from 110° to 105°. Indoors the dry kata-thermometer was falling from 110° to 100° in 135 seconds, and under the shirt it was falling from 110° to 105° in 147 seconds. Out of doors the dry kata-thermometer was falling in the air from 110° to 100° in 59 seconds, and under the shirt from 110° to 105° in 69 seconds.

3544. I take it you are going to compare that with the shed?—Yes. Here are readings taken on a man wearing a flannel shirt and a waistcoat. The dry kata-thermometer under his shirt fell from 110° to 105° in 231 seconds. In the case of a child with a cotton blouse and a shirt on it fell in 287 seconds. A man with a flannel shirt on and a waistcoat, 265 seconds. A girl with a thin cotton blouse and bare feet, 179 seconds. That child struck me as being properly clothed for this kind of work. I would insist very much upon the clothing point—that these people ought to be properly clothed for this kind of work.

3545. What would you suggest in the way of clothing?—A thin cotton tunic of some kind—an overall—like a tropical garment, thin and white, which could be washed. The dirt on many of these garments struck me as distressing; they were soaked with wet and dirt.

3546. The question of dress is a point which is occupying our minds very considerably; but the point is, how are you to prevent the moisture falling on the worker without increasing the heat?—I do not think that really matters very much—that moisture spraying off on to the clothes, if they are only thinly clad. If you get them thinly clad and open enough—wavy enough—so that the moving air can get under and through, I do not think the moisture matters a bit. You want to get the garment quite loose. I find the kata-thermometers under the shirt fall quicker whenever you move. Some of these operatives have told me the same—they are made cool by moving.

3547. You probably notice the spinners wear waterproof aprons to keep their clothing dry?—Yes, I noticed that.

3548. But very few wear any protection for the chest?—No.

3549. What would you suggest for the chest?—I myself would not let them have those waterproof aprons at all. I would provide them with a clean white garment which they could put on when they enter the works and take off again in the dressing rooms. That would make an enormous difference to them, I think—if they had dressing-rooms and these garments were provided. It would make a great difference to their efficiency, especially if they could bathe after work.

3550. Of course, there are great practical difficulties in the way of that?—Yes, I recognise that perfectly well. I am talking of an ideal condition; but, I do not think those waterproof things can help them at all. I should say they made them hotter.

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* Appendix D.

3551. Remember this—these workers, summer and winter, go home with the same clothes on?—Yes.

3552. Assuming, for the sake of argument, that is necessary, would you then do away with the protection for their clothing?—Yes, I think so.

3553. Would you let them go home in wet clothes?—Yes. They ought to change, of course, but if they walk rapidly home and walk themselves dry, it will never do them any harm. I do not think wet clothes do anybody any harm at all as long as they keep themselves warm. If they walk themselves warm and dry it would not do them any harm.

3554. But on the chest—say a cold east wind blowing?—I do not believe it would do anyone harm if he walks himself dry. It is all a question of sitting about. If they sit about in wet clothes, of course, it cools the body very considerably.

3555. Of course, these women go to and from the mills; they go home for their dinners and at the end of their day's work. Supposing there is a cold east wind blowing and they had all their body-clothing wet: would that be liable to bring on chill and chest complaints?—I do not know that I have any evidence on that matter at all. I think the evidence that colds, or pneumonia, or anything of that kind is produced by cold is very doubtful. I doubt if there is any positive evidence on the matter at all. There is any amount of evidence that it is produced by infection. I do feel that these people would be enormously improved in their comfort, and probably in their health too, if they could have some garment to put on, in the mill, and take off, and put on their own clothes to go home in. I believe that is one of the greatest things that could be done for them—a suitable garment, like a person would wear in the tropics.

3556. I am perhaps labouring it, because this question of clothing has been exercising our minds, and has exercised the minds of former committees. It has been discussed over and over again. What would you suggest as a suitable garment, when you use the term a suitable garment?—I should suggest something like a loose cotton robe, or overall, or pyjamas—that kind of thing—a loose cotton thing that could be taken off—it would not matter getting wet in the mill—and hung up in drying rooms.

3557. You see cotton does not absorb much. I suggest to you whether you would prefer woollen material, which would be more absorbent; and I think if you put wet cotton and wet wool on your skin, as far as comfort is concerned the wool would be more comfortable?—There is a great divergence of opinion about that. There are many people swear their rheumatic pains are cured by wearing cotton—cellular cotton I am talking about, loose cotton with plenty of air in it. Through such a garment you would get movement of air, especially if you are going to give them more movement. Of course, I recognise it means a very big change, to give garments and dressing rooms where all these operatives could change from their own clothes into this garment and back again: but I believe it would have a tremendous effect on the peace and comfort and health of the operatives, and probably make them of far greater economical value as workers because all these things seem to pay.

3558. Have you anything further you would like to say to us?—I should like to mention some figures which I took in an experimental chamber; just an example or two. In this chamber the wet bulb was 84°, rising to 86°; the dry was 90° to 91½°. Under the cotton shirt the wet bulb fell from 110° to 100° in 274 seconds—there was no movement of the air at all in this chamber—and the dry bulb fell in 912 seconds. A fan was put on to blow the air about in this chamber—the same air; no fresh air was let in at all. It is a small chamber, holding about three cubic metres of air. The person was sealed up inside it, and electric stoves were inside for heating the air, and the moisture was increased by steam. On putting the fan on and blowing the air about fairly forcibly the wet kata-thermometer fell under the shirt in 149 seconds, and the dry kata-thermometer fell in 465 seconds, against 912. So that the rate of cooling was doubled by just putting this fan on. That is what movement of the air can do without bringing in any fresh air at all. That dried up the sweat. With the fan off the man was visibly sweating; the sweat ran off him. With the fan on, his face dried up with no sensible sweat, and his comfort was increased to an extraordinary extent. There is one other point I have got out in these researches, working with a college friend of mine, Dr. Muecke. We find in these hot places where the air is heated by convection and is hotter at the head level than it is at the foot level, the nose gets congested. We examined the mucous membrane in the nose, and the nose gets congested and swollen so as to almost shut up the nose, especially if there is any deflection of the septum, and there is a good deal of thick secretion poured out of the nose. The appearance of the nose differs quite from what it is when you are out in the open air, or when you put the fan on in the chamber and blow air about forcibly. When the fan is put on the nose goes back to a condition which is more like it is out of doors, and in a condition much less susceptible to infection, I believe. I think the congestion of the nose, and the air sinuses in connection with the nose, causes the stuffy feeling in the head which we all experience in warm, confined air, and also exposes us to increased infection, or lessens our resistance to infection. We get infected in crowded rooms by saliva spray being coughed or sneezed out, and it is, I think, this condition of the nose which makes us more liable to be infected. You get your nose congested in the way I have described, and the bacteria are caught by it, and you go out into the cold air and the vessels constrict, and you are left with the mucous membrane swollen and full of thick secretion, and the blood is constricted out of it, and that makes a suitable culture medium for the organisms which you have been infected with to develop on. How far that occurs in these sheds I have had no opportunity of seeing. It would be worth while getting some observations made, I think, on operatives.

3559. I think you have formed some opinions in regard to the question of carbonic acid as a measure of impurity?—Well, I have reached a conclusion which has been reached by others, for example, Dr. John Haldane and Professor Lorrain Smith; that carbonic acid has nothing to do with bad ventilation. It does not and cannot contribute in the least bit to our feelings of discomfort that occur in what we call badly ventilated, crowded rooms. The percentage of carbonic acid which you find there cannot have the slightest effect on the carbonic acid which is in the body. It does not enter into the body; it does not increase the concentration of carbonic acid in the body in the slightest degree, because the respiration is so regulated as to keep it out. The only effect of breathing a little more carbonic acid in the air is to make us breathe a little more deeply, which is a good thing for the lungs. The occupation of warm, airless rooms, accompanied with sedentary work, diminishes the breathing. One ventilates one's lungs very little; one takes in little oxygen, and one's appetite is depressed; one wants little food, and the result of all that is the lungs are ventilated very little, they are not properly opened out, and I believe that contributes very greatly to infection of phthisis and tuberculosis. At the same time the saliva spray infection caused by one who is suffering from phthisis is of a massive kind in confined places. The great benefit of open-air treatment is not because the air is chemically pure, but because the cool moving air increases the metabolism and makes us breathe more—opens out our lungs better. Dr. Flack and I have been working together on the East Coast, and have found out that merely sitting in the wind increases one's pulmonary ventilation and metabolism.

3560. The ventilation standard which is now in force though expressed in terms of carbonic acid secures that the air should be changed a certain number of times to produce certain results?—Yes.

3561. I take it that we may expect some benefit from that?—I think the benefit consists in the cooling which is produced—the cooling and movement which is produced by the changing of that air.

3562. Then again we may take it that when there are a very large number of workers in a shed many of them have colds or coughs, and are sneezing or coughing, and that those germs would be more or less dangerous to their neighbours—I mean to say would probably produce infection?—It is very difficult to stop spray infection in coughing and speaking.

3563. I saw in some paper of yours lately you suggested the use of a handkerchief to sneeze into, and so on; but that would be quite impracticable in a weaving shed?—Quite.

3564. Then to meet that (assuming these germs are given off by coughing and sneezing, or there may be other infectious germs) you think the frequent removal of the air would do something to remove those?—I think you want a current of air to prevent spray infection, which no manufacturer would allow because of the difficulty of keeping the shed moist. You have to face the explosive driving out of those particles of saliva by the man you are talking to. The current of air may reduce, but will not stop the carriage of the particles of saliva, and if you are face to face with a man big particles may pass into you and give you quite a massive infection.

3565. I am simply putting that question, because there has been a considerable amount of money spent on mechanical ventilation with a view to maintaining the standard of carbonic acid, and it becomes a question of whether that can be reconsidered or modified in any way?—I think it is all doing good. In so far as it is cooling and altering the stimulus to the skin it is doing an immense good, and one would not stop any driving in of air of any kind whatever. One would get as much air in as possible, but not from the point of view of chemical purity, and not with any great hope of altogether stopping the spray infection; but for the purpose of reducing this and the dust in the air, and of keeping up the vigour and health of the people by acting on the skin.

3566. (*Professor Lorrain Smith.*) Would you give us again the difference between the kata-thermometer reading and the wet and dry bulb temperatures? You say the latter does not tell the true story. I would like you to put that as a statement?—Well, you see, on moving from indoors at the seaside to out of doors, one has the wet and dry bulb giving practically the same readings, indoors and out of doors, but the cooling as shown by the kata-thermometer will be double as quick, very often out of doors as indoors, and that is exactly what one feels. The one instrument shows the bracing effect of the cooling air and the other does not.

3567. Would it be putting it fairly to say a kata-thermometer measures the rate of cooling and the dry and wet bulb thermometer does not?—Yes, I see your meaning. I would say the wet and dry bulbs measure the average conditions of temperature surrounding them—the temperature of the air and the radiant heat coming from the walls, and so on, the average temperature of everything in a space round them, but the kata-thermometers give you an indication of the rate of cooling.

3568. So that with the same difference of the wet and dry bulb might have very rapid cooling or very slow cooling, according to the circumstances?—Yes, that is the point. All these figures show that. Supposing the wet and dry bulb read indoors and out of doors 59° and 62°; in the one case you might have rapid cooling and in the other slow cooling.

(*Chairman.*) And the kata-thermometer brings out that difference.

3569. (*Professor Lorrain Smith.*) Another point is, how would you apply this to getting at the condition of a shed?—You have to go round with the instruments at present and take readings in the way I described, but I am having constructed now a recording instrument I have considerable hope of. This consists of a little electric furnace to be kept by automatic regulation at body temperature, and surrounded by an evaporating surface kept wet by a trough of water. The amount of electric current required to keep this furnace at constant body temperature will be read. That will show at any moment—it will be always running—the amount of energy required to keep the little furnace at body temperature, and that will indicate the rate of cooling of the furnace.

3570. But in the points you have brought out the conditions seem to vary so much in the sheds from one place to another?—Yes, they do. Near a door an operative is much better off than he is at the stagnant end of the shed.

3571. (*Professor Petavel.*) They do not think so?—Most of us like to be warm and comfortable, but too much warmth may not be good for us.

3572. (*Professor Lorrain Smith.*) I do not quite understand how you would express the conditions in a shed in kata-thermometer readings, as you would express them in wet and dry bulb readings?—Well, you will find if you do not get near moving wheels or a door, that the kata-thermometers give fairly concordant readings in the different stands.

3573. I was going to ask you about the question of comfort?—You will never get the operatives to stand anything else but comfortable conditions.

3574. Yes, but their ideas of comfort, do not you think, are perhaps modified by their habits of work?—I think so. I should think they get like tropical people. People from the tropics coming back to this climate to begin with feel it very much. Their heat regulating organism gets set in an entirely different way.

3575. Do you think so far as these operatives are concerned that that is harmful; that there is not any indication of deterioration of health resulting from that?—Well, I cannot answer that at all. I do not know what the statistics of these operatives are, *e.g.*, how they come out in the statistics of phthisis. It is a thing I have not looked into. I should have thought these people tend to run at rather a low rate of vitality, but even if their life is not shortened they may not live as vigorous and as healthy a life as they might live under better climatic conditions. I think the conditions might be made better in these sheds in respect to clothing and the movement of the air, and they might then be more vigorous and get more out of life. That is quite a different thing from the actual shortening of life.

3576. Oh, quite?—A plant might have a stunted existence under bad conditions and yet live for a long time, but if it was properly looked after it would be a healthy vigorous plant and, perhaps, live longer.

3577. I did not quite gather the conditions you were alluding to when you spoke of congesting the mucous membrane. You said it was heated by convection?—Yes, the kind of conditions you would get, for instance, in this little experimental chamber of mine where the electric heaters are half-way up the chamber when the air is much hotter at the head level than it is at feet level. Where the air is heated and the room warmed by convection you get the air much hotter at the head level than it is at the feet level. With sources of radiant heat the conditions are otherwise. I think that cooling of the feet diminishes the action of the cooling mechanism of the skin and causes constriction of the skin, and the nose in consequence becomes congested.

3578. My point is: how does that bear on the shed question? Do you intend this as a criticism on the condition of the shed?—I never took any observations at the feet level and the head level. I should think the air is very well mixed in the sheds by all these pulleys and wheels moving. It is probably much better mixed than it is in an ordinary room where you have the air heated by convection, *e.g.*, by an anthracite stove or so-called gas radiator. I should like to know whether the nose of the operative does change. It is worth looking into.

3579. I do not know that we have been able to get any direct evidence that they do suffer particularly from infectious colds, or any of the ordinary infectious conditions?—I should think they are probably quite free from anything of that kind.

3580. The condition we have to pay particular attention to is that of comfort, and comfort seems particularly a matter of habit?—I think so. It is the same in the House of Commons with members that have joined recently, so the engineers tell me. The old habitues do not complain. Whether they give it up in desperation or whether they do not feel it, I do not know, but I think they become habituated just like those who go to the tropics.

3581. Then do I understand you to say the protection of the clothing from the spray of the spindles might be rejected?—That was my feeling about it; that these mackintoshes do not do them any good. They had much better have a garment they can leave off.

3582. But the garment you recommended was a garment to be left off and dried, but the evidence is they will go out in cold wintry weather and will have to walk home, and no doubt be interrupted in the road, frequently——

3583. (*Mr. Ewart.*) May I intervene? I would like to say, as a matter of history, that the waterproof aprons were forced upon both the employer and employed in this country. Previously the favourite apron, which very often came up to the neck, was made of what is called heysham. It was taken off before they left the room and, notwithstanding all that was said to the contrary, there is considerable drying takes place in a spinning room. It is well recollected that during the night these aprons used to get quite dry.

(*Chairman.*) It is very important. Will you tell us, what is heysham?

(*Mr. Ewart.*) Well, it is the Dundee name. It is heavy jute stuff, such as is used for packing bales.

(*Witness.*) A kind of sacking. The old sack over the shoulders on a rainy day was very good.

3584. (*Chairman.*) That is very far from the garment you propose now?—I think the old apron is very much better than that waterproof apron.

3585. Is there any record available of the result of the practice in the United States in moving the air in factories and workshops—not introducing air, but moving it?—I can only recall at the moment some very interesting papers on Pullman cars. The conclusion reached was the same as I have given you; that it was all a question of movement of air that adds to the comfort of the cars.

3586. Does the practice continue? — In these Pullman cars on railways it was proved that the comfort has nothing to do with the chemical purity, but movement and temperature.

3587. Those are electric fans, I suppose?—They arrange for the air to come in at a particular kind of ventilator in the upper part of the car, and the movement of the train makes it go in and spin round well in the car.

3588. In the factories and workshops which I saw in the States the fans were like beaters on the shaft?—I do not know anything about that.

3589. (*Professor Petavel.*) I understood you to say that the health conditions depended very largely on the amount of heat loss from the body? Is that correct?—Yes.

3590. Now can you give us a definite figure for the most favourable rate of loss of heat expressed in, say, heat units per square centimetre of the body per second?—No, I do not think so. No such figure has ever been calculated for the human body. The conclusions I have stated are derived in this way. A rapid rate of cooling going on from the skin provokes an alteration in the circulation and a new distribution of the blood. That sends blood away from the skin and into the viscera and provokes increased breathing, increased metabolism, a greater oxygen intake and output of carbonic acid. It accelerates the pulse and so on and in every way makes the body live at a faster rate. The cool outside moving air also has a stimulating effect on the cutaneous nerves and by its variability prevents monotony. Air which moves in one direction and with uniform velocity is less good. That is where plenum methods fail: they give monotony of movement and temperature.

3591. Does the kata-thermometer measure anything else but the amount of heat lost?—Yes, it indicates the way it is lost to a certain extent. The wet one is losing heat by evaporation of moisture; the dry one is losing heat by radiation and convection, so the two do indicate how the heat is being lost—how quickly heat is being lost by evaporation and how quickly by radiation and convection.

3592. Do you take it the skin is represented by the dry kata-thermometer or the wet kata-thermometer, or by some average result in between the two?—The skin is always losing heat by the three ways by radiation and convection and by evaporation of moisture, but by bringing into play the sweat glands and the flushing of the cutaneous vessels we can alter the loss of heat. One can switch on the blood on to the skin and increase the loss by convection or radiation, or switch on the sweat glands and increase the loss by evaporation. One cannot similarly alter the instrument but one can find out what effect the atmosphere on ideal spring days has on the rate of cooling, and thus obtain an empirical standard as to what conditions are comfortable, and then try and make our rooms as near that as possible.

3593. You can give us no definite idea as to how near the skin condition is to either of the two bulbs, which of the two represents the heat lost from the skin, or how the heat lost from the skin can be represented by the two bulbs?—One can only empirically graduate the instrument by our feeling of comfort on ideal days. In the ideal conditions I have been speaking about the wet bulb loses heat in about 45 seconds and the dry bulb in 135 seconds—something like that, 45 and 135. If you get your room in such a condition that you get that, about 45 and 135 seconds, and have it ventilated and heated in such a way that it is not monotonous, then you get your comfortable conditions.

3594. You have not reduced those to the ordinary scientific method of heat units per square centimetre per second?—No, because I am simply using it as an empirical instrument. I do not see how one can use it in any other way.

3595. Are the results taken inside the shirt of an individual comparable with the results taken in the shed? It strikes me that in the one case the thermometer is surrounded by the atmosphere on all sides, and in the other case it has on one side the skin temperature which would effect in itself its loss?—I put a wire cage round about the kata-thermometer so that it is kept off the skin and it lies in an atmosphere between the skin and the shirt. If the air is moving of course the instrument shows that and indicates how the blanket of air which is entangled under the clothes is altered and moved away. Again it is merely an indication of what is happening. My standard is the rate of cooling one gets when one is quite comfortable. When the rate of cooling is much quicker one feels cold, and when it is much slower one feels hot and stuffy. The readings of the instruments do agree with one's feelings.

3596. (*Mr. Cummins.*) With regard to the workers going to and from their work, you suggested that as long as they were moving wet clothing had no effect on the health. That is what I understood you to say. But supposing that worker gets home into a cold house, and perhaps has a fire to light, what would be the effect then?—I think the whole question of how far exposure to cold does produce actual illness is a question very difficult to answer definitely and positively. I know it is popularly believed that the cause of winter illness, colds and inflammation of the lungs, and so on, is all due to chill. But if we take a case like the Titanic disaster where delicate people are exposed to sudden chill for many hours, they do not get cold and pneumonia; but when they go into hot atmospheres where they meet infected people and are exposed to spray infection, and come out again into the cold moist evening air, they do get colds and sometimes pneumonia, I mean to say the Titanic evidence seems to show it is not the chilling. If people are infected by somebody who is in an acute state of infection they catch a cold in the head or pneumonia, and so on, but mere chilling by itself will not do it. In the Panama Canal district a very high mortality from pneumonia has been stopped by the destruction of flies. Here infection and not climate has been the cause of the illness. I believe the human body has enormous powers to stand chilling. We have had to stand it in the history of our evolution. Every domestic animal out in the fields gets wet and cold and stands it, and we can stand exposure to cold out of doors. How far some lose power to stand it by living in a confined over-heated atmosphere is a question I think all the evidence goes to show that artificial methods of heating and not cold depress the vitality and cause sickness. Out-door workers, gardeners, agriculturists suffer least from phthisis and respiratory disease.

The witness withdrew.

Mr. WILLIAM J. BRABAZON called and examined

3597. (*Chairman*). You are the manager of the Rose Bank Weaving Company?—That is so

3598. What classes of linen do you manufacture?—Well, we manufacture from coarse up to fine linens.

3599. Can you draw a distinction between coarse and fine?—Roughs and ducks are what we call coarse, or canvas.

3600. Where does the fine begin?—The fine linens are our boiled linens, from $16^{\circ\circ}$ up to $20^{\circ\circ}$—38 inch boiled. Then of course we have the medium linens.

3601. What are they?—About $9^{\circ\circ}$ up to $15^{\circ\circ}$ or $16^{\circ\circ}$ green.

3602 What yarns do you boil?—The biggest number of boiled yarns we use are 70, 75 and 80's.

3603. That is fairly fine, I suppose?—It is, yes. That is for warps.

3604. Where does that flax come from? Is it Belgian or Russian?—I do not know particularly, but I know we get yarns made from our flax, and we get yarns made from Belgium flax.

3605 Where does the boiling process take place? Is it in your own works?—We have a boiling plant there.

3606. Will you tell us the advantages which you derive from the boiling?—Well, in my opinion, I think you can make a boiled yarn easier, it weaves a little easier in the loom. You can put your weft on it better. That is one of the advantages.

3607. Will you tell us any other advantage?—Well, I think it looks nicer. It is more saleable in the particular class of cloth we make.

3608. Anything else?—Well, I do not know. The boiling of it does not take very much out of the strength; it does take a little out of the strength, but not very much. I think it takes the dressing better—the boiled yarns.

3609. Those are the advantages?—Yes.

3610. Can you tell us any disadvantages?—Well, really I do not know of any disadvantages at all, because in our place we prefer the boiled yarns, and our workers prefer the boiled yarns.

3611. Now, are you, by using boiled yarn, able to allow a greater difference between the thermometers than you would if it were not boiled yarn?—No, I find that we cannot work with more than the two degrees difference. For instance, if the one, bulb was at 71° and the other was at 69°, that is what I consider good weaving conditions.

3612. Yes, but would it weave it you had, say, 3°?—It would weave, but not as satisfactorily. It would not make as nice a cloth.

3613. I will just put it to you in this way. Some members of our Committee going round reading the thermometers found in a certain shed a difference of, I think, four or five degrees, and fine goods were being woven. We asked how that could be done, and the answer was "We are using boiled yarn"?—Yes. I have never found that I could weave 38-inch boiled yarn satisfactorily with a difference of three or four degrees between the two bulbs.

3614. Have you ever tried?—We have, unfortunately, had occasions when it has been like that according to the conditions of the atmosphere, and it was not satisfactory at all. It did not make satisfactory cloth, and the weavers were not getting over it the same way, and they had more breakages.

3615. As you derive certain advantages which you have told us, from boiling the yarn, can you tell us why it is not more universally done?—I cannot.

3616. Take your own case. Why should not you boil all your yarns?—Well, we are not asked for them boiled.

3617. But you say you get a better cloth?—Yes.

3618. The cloth weaves better, and so on?—Yes.

3619 Why should not you boil all the yarn if it improves your cloth?—Well, there is any amount of cloths we are asked to make We are asked to make them green, not out of boiled yarns.

3620 Does the boiling affect the colour, or how does it affect the cloth?—I mean to say, supposing you had a piece of cambric or linen put before you, could you tell if it had been made with boiled yarn or with green yarn?—Yes

3621. What is the difference?—The one would be quite a green or grey colour, and the other would be a whitish or it may be a creamish colour.

3622. Then it affects the colour?—Yes, the boiling does.

3623 What are the boiled yarns used chiefly for? Are they going to be dyed or simply bleached?—No, they are bleached mostly, I think.

3624. And what about the other class of goods, are they treated the same way, bleached also?—Yes, there are green goods bleached, there are some ordinary grey finish.

3625. After they are bleached can you tell whether they were made from boiled or green?—No, I could not

3626 The reason you do not boil all is simply that some customers ask for green yarns?—Yes.

3627. And, of course, they know best what they want to do with it?—I would suppose so. They know the class of cloth they want.

3628 (*Mr. Ewart*) Is it a fact that some makes of goods are not to be manufactured without boiling the yarns?—We make certain classes of goods that we could not make in green yarns at all, because we could not get the weft home, as we call it. We could not get the requisite number of shots per inch that we are asked to give.

3629. It is a matter of necessity in such cases?—In the case of those, the fine boiled linens, it would be. We could not, as I say, put our weft home, and you would have to put so much weight on your loom to get your cloth made that you would cause considerable breakages of the yarn.

3630. The effect of boiling the weft is to soften it?—Yes

3631. And to reduce it in bulk?—Yes.

3632. When the goods are for bleaching there is no harm, because they would be boiled afterwards in any case?—The same reduction, I believe, would happen in the green goods.

3633. By the time they are boiled?—By the time they are bleached the same reduction would happen, both in the green and the boiled, taking it all round.

3634. So far as you know the boiling is not following any fashion, but is a manufacturing necessity when you come to certain qualities?—Coming to those finer qualities we make, as I said before, we could not make them I do not know about the fashion, but I think it is a necessity, and we could not make them in green linens.

3635. (*Professor Petavel.*) What sets and counts would those be?—From $16^{\circ\circ}$ to $21^{\circ\circ}$ for boiled linens.

3636. And the counts?—The counts of the yarns used—from 65's warp to 85's warp. Do you want the wefts?

3637. If you please, yes?—90's weft to about 140's

3638. So I take it they are very closely set cloths?—You mean threads per inch?

3639. Threads per inch, in view of the size of the thread?—Yes, very close.

3640. That is a special feature, is it, which necessitates the boiling to get the weft sets sufficiently close?—That is so; to get in the proper number of threads per inch As well as boiling our wefts we soften them in a softening machine, also to help to put them in.

3641. (*Mr. Cummins.*) Is not the boiled yarn coarser to the set than the green yarn?—No Do you mean if you take a 16^{00} or a 17^{00} boiled and a 16^{00} or 17^{00} green you would use the same yarns?

3642 Yes?—We practically use the same yarns There might be a few numbers difference in the weft.

3643 (*Professor Petavel.*) Finer or coarser?—Finer for the green—about ten numbers.

3644. (*Mr. Ewart.*) What is the reason for that?—That just happens to be our set. that is all.

3645. Is it because the coarser yarn cannot be put on?—The coarser yarn is more difficult to put on, there is no doubt You take hundreds weft green, and reduce it 25 per cent. In your boiling you make it considerably finer.

3646. (*Professor Petavel.*) Is there any reason, except trade custom, why boiled yarns are not universally used, as they seem to facilitate the weaving?—No, I do not know of any reason at all. I think it is just as you say, there is a trade custom.

(*Chairman.*) In answer to my question I thought you said the reason was it produced a different colour.

(*Professor Petavel.*) Not after bleaching.

3647. (*Chairman.*) Not after bleaching, but before bleaching?—The question of colour does not enter into goods that are for bleaching.

3648 (*Professor Petavel.*) So boiled yarns, in your opinion, could be used for the fine cambric trade?—You could make cambrics out of boiled yarns, yes. You can, but we do not do it in our place at all. We never have made them out of boiled yarns.

3649. Would the weaving be easier in that case, do you think—less breakage for the same setting and counts?—Well, I do not know. I have never made them at all I have never made a cambric out of boiled yarns. I never did I do not suppose it would be very difficult to make at all.

3650. (*Mr Cummins.*) The cambric is a lighter material than the linen?—Yes, it is a good deal lighter You have a lighter yarn to work on; and if you are taking a good deal out of it in the boiling it might weaken it a good deal.

3651 (*Mr. Ewart.*) I was going to ask that question. You have not actual experience of boiled yarn cambric?—I have not

3652 Do you think you could make it out of the same quality of yarn?—I am afraid you would require a little bit better yarn, because you boiling takes something out of the strength of it. Of course on the other hand, if your weft is boiled in your cambric it goes in very easily, and of course there is less strain on the warp.

The witness withdrew.

Mr. Andrew McAlister called.

3653. (*Chairman.*) I think you are the manager of the Parkside Weaving Company?—Yes, I am.

3654. What class of goods do you weave at your works?—We weave both green and boiled yarns in a dry shed.

3655. In a dry shed?—In a dry shed—50's lea and heavier, and we weave those yarns into damask and fancy weaves.

3656. (*Mr Ewart.*) Is that for warp?—Yes.

3657. (*Chairman.*) What else do you weave?—In a moist shed we weave both green and boiled yarns, and those yarns are 50's lea and lighter, generally speaking.

3658 Do you do any fine at all?—Yes, much lighter than 50's. I mean they are all 50's and above. We weave 100's warp.

3659. In the same room?—Yes, in the moist shed.

3660 Will you tell us what you consider to be the advantages of boiling the yarn?—The object is to make the yarn lighter; to make it easier woven.

3661. It does not break so easily?—The yarn is less bulky and easier woven.

3662 Does it lessen the breakages?—I should say not.

3663 But it is more pliable?—It goes together easier on account of it being reduced in bulk and weight.

3664. What is the average difference between the thermometers in the room where you use the boiled yarn?—We are confined to a minimum of two degrees, but the average, of course, is above that. We keep it as near two as possible.

3665. You endeavour to keep it at two?—We endeavour to keep it at two, but we cannot always. It is sometimes three.

3666 And at what point do you begin to find that the weaving becomes difficult?—We find that with a difference of two degrees the weaving improves as the temperature goes up.

3667. And where does it begin to get bad?—We reckon that if the temperature is under 60° it is not so good with a difference of two degrees—certainly not so good as above 60°.

3668. Do you consider that by boiling the yarn you can have a wider difference between the wet and dry bulbs?—No.

3669. We noticed this difference—that very fine yarns were being woven, and the difference was four or five degrees. . We asked the reason and we were told that it was because they were using boiled yarn. Now have you ever tried to weave boiled yarn with a difference, say, of three or four degrees?—Well, I have not, but I consider it might be possible under certain conditions. When I answered your question, Sir Hamilton, I was reckoning the general way in which boiled yarns were used. Generally speaking the boiled yarns are woven into a finer set than the same lea of green yarns, and it is to enable that to be done that the yarns are boiled. Boiled yarns may be woven into a very light cloth with three or four degrees of difference. I could quite understand those conditions.

3670. A loose weave?—A loose weave, yes. We could make 60's lea green into a certain set.

3671. You will understand our position. What we are trying to clear up is this: we saw these fine yarns being woven with a difference very much above the average The answer to our question why, was that it was because boiled yarns were being used. Evidently that was something that wanted clearing up, because if by boiling yarn you can improve the conditions from a health point of view, it is of some importance. You said you could conceive conditions under which it could be done?—Yes, but they do not generally prevail in our trade

3672. What are those conditions where you think it could be done?—It could be done if the yarns were being woven into a very loose weave.

3673. (*Mr. Ewart.*) Do you make goods from bleached yarn?—We do, but not very extensively.

3674. Do you use them in the dry shed or the moist shed?—We use them in both, but of course in the dry shed it is very heavy yarns.

3675. (*Chairman.*) But with a difference of two degrees you can weave satisfactorily?—Well, it would be more satisfactory if we could go to less than two degrees at a low temperature, or if we were to have an average of two degrees.

The witness withdrew.

Miss EMILY J. SLOCOCK called and examined

3676. (*Chairman.*) You are Senior Lady Inspector of Factories, stationed in Ireland?—Yes.

3677. How long have you been in your present division?—About 18 months.

3678. And your division covers the whole of Ireland?—Yes I have visited nearly all the flax spinning and weaving factories in Ireland.

3679. Perhaps I had better begin with the spinning rooms. Of course we know that the floors are very wet, and to all appearances things do not look very comfortable. Have you given any consideration to the question of ventilation in the spinning rooms?—Ventilation and temperature, yes. I may mention I have visited all the spinning mills in Ireland, except 12. In visiting spinning rooms I have noted where the conditions seemed specially bad. That was where the temperature was high and the workers seemed rather distressed—perspiring very freely. I just made out to-day a record of these places, and I find that in only three rooms out of 22 spinning mills visited where I noted these conditions, was the wet bulb below 75°. The conditions were such that I made special notes of the temperature and ventilation, and I found that in many cases the temperature was over 80°, and in only three rooms was the wet bulb below 75°.

3680. What time of the year?—All times of the year. None in August, but otherwise the ones that I noted were as high in November and December as in June.

3681. (*Professor Petavel.*) The rooms below 75°, was that in winter or summer?—One in September, one in July, and one in June.

3682. (*Chairman.*) Have you noticed that in some of these rooms there are mechanical appliances for ventilation, whilst in others they trust very much to the windows?—Yes.

3683. Have you noticed any difference in the temperature where the mechanical ventilation is in use?—I should say, generally speaking, the mechanical is the best, but in some of these rooms there is mechanical ventilation.

3684. Of what kind? Do you remember if they were simply fans?—Yes, open fans.

3685. Were there ducts to distribute the incoming air to different parts of the room?—Speaking from memory I should say not in these particular mills. I think they would be just loose fans and the windows.

3686. Have you formed any opinion as to what you would consider the best method of ventilating these rooms?—I find that very often where they rely on windows the windows are simply pulled down and create a terrible draught for the workers If you have window ventilation it is very much better when the window opens into a kind of draught screen or shutter. I think that in conjunction with fans is probably the best form of ventilation.

3687. Is there anything further that suggests itself to you in regard to the ventilation?—Well, there is this one point, that the present special regulations give a standard of ventilation which seems rather to supersede the general requirements in section 7 of the Factory Act, that sufficient means of ventilation must be provided in every room.

3688. Do you refer to that of the nine standard of carbonic acid?—What I call the standard of ventilation laid down in the special regulations rather seems to supersede section 7 of the Factory Act, which says that adequate means of ventilation must be provided in every room. I only mention this because I have in my mind a concrete case. You can get (especially in dry sheds) in a very large area a small number of persons employed, and a result which complies with this standard in the Regulations where there are no apparent means of ventilation at all—no fans, no ventilators, no windows, only some small kind of opening under the glass roof I think that it would be an advantage in revising these rules if it began by stating that "in every room in which "persons are employed adequate means of ventilation "must be provided, and the arrangements shall be "such as"—and then going on here

3689. Such as to maintain a standard of so-and-so?—Yes. I know of a concrete case which I have been dealing with lately, certainly, under the Factory Acts, one would have required ventilation, I mean ventilators to be put into the rooms. When you have to deal with the Regulations you find that this place complies with the standard there laid down.

3690. One section seems rather to deal with the purity of the air and the other with the temperature of the air. You see we have two things to consider We have to consider both the temperature and the purity?—Yes, but this standard here seems rather to be in itself sufficient, but if one wanted to take proceedings against a factory where there were no apparent means of ventilation, and it was proved that although there were no means of ventilation it was in conformity with this Regulation, I do not think you could go any further.

3691. It comes to this, you suggest that something should be put in which will deal with temperature as well as ventilation?—Yes, ordinary ventilation, general ventilation

3692 We want to keep the temperature down to what is consistent with carrying out the work?—Yes

3693. Have you made any inquiries on that point or have you taken any observations as to the difference that is necessary between the wet and dry bulb temperatures for carrying on the work?—No, except that I have, I think, only twice found an infringement of the Regulations, that is, that there was barely a difference of two degrees, and in a very large number of cases, even where I considered the conditions were bad the difference was five or more degrees.

3694 (*Professor Petavel.*) That is in spinning rooms?—Spinning rooms only.

3695 And it was in a weaving shed that you found a difference of two degrees?—Yes.

3696. We are getting the two a little mixed, I think?—Yes I was speaking of both, certainly In spinning rooms I find generally there is a difference of five degrees or more—sometimes ten.

3697. Quite so. That is what I wanted to get at?—Yes.

3698. (*Chairman.*) Now in regard to the water in troughs · have you found the steam as a rule well kept in or is it allowed to escape into the room?—In some cases it is allowed to escape into the room, especially when the workers tilt up the boards after they have been washing the troughs. Then the steam is freely escaping into the room and naturally the room is very hot

3699. Of course there are various devices. In some places there is suction for carrying off the steam, but generally speaking the method seems to be to try and confine it by covers?—Yes.

3700. Could you suggest any improvement on the methods for keeping the steam from getting to the room?—No, I think that the covers if they are kept in position are, generally speaking, fairly satisfactory, but I think that very often probably the water is a great deal hotter than is necessary. Sometimes I have mentioned that the room seems very hot. I remember one particular case. They took me up to look at the troughs and the manager remarked "Well, it is practically boiling." It was not actually at boiling point, but it was all bubbling over, and I often find the water in the troughs is very hot.

3701. Now, have you considered the old controversy, the long vexed question of splashguards or no splashguards?—Yes, to a certain extent.

3702. And what would you say about them?—I should say that splashguards of suitable construction might be applied to frames of 2-inch pitch and over with advantage in some cases.

3703. You would fix it at 2-inch?—I think about 2-inch, instead of 2¾-inch, as now. It is difficult to fix it exactly, because it rather depends upon the nature of the work, the nature of the yarn.

3704. And I suppose there are some alleys where there would hardly be room to work them?—Yes, that is a great difficulty

3705. Whatever recommendations may be made about splashguards, we have yet to provide for the workers who are not protected by them, and there will always be a certain amount?—Yes.

3706. You know, of course, the present state of things. The law says that where there are not splashguards, aprons and bibs shall be provided and worn. Well, it is no secret, of course, that that is absolutely a dead letter. Very few of the workers wear the bibs, and if the requirement was strictly observed now in those cases there ought to be splashguards, but, as a matter of fact the law has been in this respect totally ignored?—As regards bibs.

3707. As regards bibs?—Yes.

3708. And also as regards the provision of splashguards where bibs are not provided?—Yes. They do generally wear aprons.

3709. They have power under the law to require the splashboards to be put on where the bibs are not worn, but for some reason or other that law has never been enforced?—The waterproof aprons with waterproof bibs are exceedingly hot and uncomfortable for the workers in these hot temperatures.

3710. I know they are I first want to point out that the law as it stands has been ignored. Of course that cannot go on. If the law is bad it must be altered, or else if it stands it must be enforced. But what I want to get at is this. Where they have not got splashguards, what would you suggest in the way of suitable protection for the women workers?—For fine spinning, under 2-inch pitch?

3711. Where they get splashed?—I would suggest for fine spinning a porous canvas as is now worn by the workers in one or two instances in very fine spinning rooms.

3712. Porous canvas?—Yes.

3713. A sort of absorbent material?—Yes, a sort of absorbent material. It is a kind of course canvas, really, and they can wear aprons and bibs of that material quite comfortably.

3714. A sort of sacking has been suggested?—It is a kind of sacking. The workers use it very largely themselves.

3715. Your suggestion is that they should have protection, I suppose, to cover the whole of the skirt both in front and behind, and the bib?—I think apron and bib of suitable material would meet the case. The difficulty here is that the word *waterproof* is introduced, and we cannot find a suitable waterproof material which is absorbent.

3716. Waterproof of course prevents perspiration?—Yes.

3717. But then you mentioned the apron. Of course, where they are in an alley they get considerably splashed at the back as well. Would you protect them from that?—Well, I was rather assuming that you were going to recommend splashguards for all over two inch, or whatever size of pitch you decide, and that for the workers employed on the fine spinning where they have not splashguards—that is, spinning below 2-inch pitch—I think the apron and bib would certainly be sufficient protection

3718. We have been over in Belgium and we find the workers there wear their skirts very much shorter than they are worn in Ireland. They came down very little above the ankle, and the advantage of that seemed to be that they did not get their skirts wet and bedraggled whenever they stooped down to work. I do not know whether it would be a practical suggestion to make here?—I think it is just a personal matter. I do not think it is a thing one could legislate for. I think, generally speaking, the spinners, who are the people concerned, do wear fairly short skirts. I have not noticed them dragging on the ground, or anything of that kind.

3719. Then supposing a law were made that where splashguards are not provided this protection shall be supplied and worn—because failing the wearing, the splashguard would have to go on at once—would you suggest that it should be supplied and kept in order by the occupier?—Yes. They supply these waterproof aprons at the present time

3720. Then do you think those should be put on on coming to work and left in the works on going away?—Yes, just as they do at the present time

3721. That brings us to the question of clothing. What would you suggest for keeping the clothing of the workers? Of course, we know quite well that cloak-rooms have been suggested, but, on the other hand, there are great practical difficulties in the way of cloak-rooms, the difficulty being that where you have one floor above another floor in a spinning room there is no room outside to put a cloak-room. Another difficulty about it is that where you have a cloak-room where the workers have to go one after another waiting to hang up their clothes, they lose 10 minutes or a quarter of an hour perhaps out of their meal hour in waiting, and they will not use them. Now where there are not cloak-rooms—and there are great difficulties in some cases about putting up cloak-rooms—what would you suggest as the best way of keeping the clothing of the workers?—Small metal lockers are exceedingly good, if space can be found for them It is, of course, extremely important in the case of spinning rooms that the clothes should be kept on the same floor. It would be dangerous to ask the workers out of the hot spinning room to go out on to the ground floor, for example, or to another floor to get their shawls. I think it is most necessary that the shawls should be kept as near to the workers as possible. Of course, in new spinning mills there is no question about it The cloak-room at the entrance with metal lockers is admirable.

3722. What kind of lockers?—A small metal locker that just takes the shawl and whatever is necessary; but for the old spinning rooms there will always be a great difficulty in that respect. Sometimes I find a kind of wooden box provided, or a kind of cupboard.

3723. There may be difficulties about space?—Yes, space is the difficulty.

3724. You doubtless have read—I do not know whether you can bear them in mind now—the recommendations made by the Committee on Humidity in Cotton Weaving Sheds?—Yes, I know that recommendation.

3725. Would some such recommendation be applicable here?—I think it would, especially in weaving sheds. I was reading it this morning. As you know the tendency here is very often just to have pegs against the wall, and where there is humidity it is very unsatisfactory. If the wall gets at all wet of course the shawls get wet. I think where there is no other space that same recommendation would probably do very well.

3726. As regards spinning rooms I do not know that there is any other question I can ask you. Going to weaving sheds, of course you have noticed the difference of readings between the wet and dry bulb temperatures?—Yes

3727. Have you taken any particular temperatures in the summer in the weaving sheds?—Yes, I have taken them I have not got them with me.

3728. You have not tabulated them?—No.

3729. How has the temperature struck you?—Well, in one or two cases it struck me as being very hot and oppressive.

3730. Had the workers made any representations to you at any time on this point?—Yes, I have had several complaints from the workers or their organisations. I think I have received about seven complaints relating to high temperature and bad ventilation in weaving and winding sheds.

3731. Have you had any representations in regard to what is known as steaming? Of course it is known amongst the workers chiefly as steaming, but I will ask you on the general question of artificial humidity?—No. I have had a complaint that they were working in steam. That referred to a very hot spinning room; but I have not had any complaints from the workers personally about the humidity in weaving sheds. Of course they often say, "Oh, it is very hot" when I go round to them.

3732. Probably you have not been able to arrive at any of the physiological effects of working; you have had no means?—No.

3733. Only just general statements?—Yes. Perhaps I might say here that I have found it exceedingly difficult in weaving and in spinning rooms, when I find the temperature very high, to take any action under these Regulations. In an ordinary factory I should always ask if it was necessary for the work; to try to form some opinion as to whether the temperature was reasonable or not; and often when I ask—especially in spinning rooms—I am told the temperature is not necessary. The Regulations do not give one very much assistance. There is no limit fixed at all. They rather suggest that provided you have a difference of two degrees they may work at any temperature; and the word "reasonable," which is very valuable in section 6 of the Factory Act, of course is not introduced here. I sometimes think it would have helped.

3734. Have you had any experience in Lancashire?—Not very much. I think I have only visited Lancashire for time-cribbing. I have not really been in the Lancashire mills.

3735. You probably know that the lower you bring the temperature the more easily you get the relative humidity necessary for weaving?—Yes.

3736. Would you suggest any special efforts to bring down the temperature in the weaving sheds, such, for instance, as compulsory whitewashing of the roofs?—That might assist in one or two cases. I thought it might be possible to stop steaming at a certain temperature, as in Lancashire, in weaving sheds.

3737. We have been trying a lot of practical experiments to see what can be done in that way, and we have not yet arrived at conclusions, and, of course, without having the advantage of these experiments we have had, it would be very difficult to fix anything?—I only meant to point out that it would assist one tremendously from an administrative standpoint if one had something to go upon. When I find, as I do occasionally—I think, perhaps, more especially in spinning-rooms—really bad conditions, I seem to have so very little remedy.

3738. But, of course, there are various methods of cooling sheds. Would you make a general suggestion that a serious effort should be made to try to reduce the temperature in the weaving sheds?—Yes, and also I think the atmosphere is less oppressive where patent humidifiers are used than where live steam is injected. I think that makes a great deal of difference.

3739. You are talking of atomised water?—Yes.

3740. Or water instead of the live steam?—Yes.

3741. Have you ever noticed in this part of the country, in the different weaving sheds, that fine and course counts are woven side by side in the sheds?—Yes, I have.

3742. It has suggested itself to my mind, and I think to others, whether it would be possible to shut off steam altogether at a certain temperature for the coarser goods, even if the steam is necessary—as I believe it is necessary—for the fine goods? I mean to say you must have the difference of two degrees, but do you think it would be possible to classify fine goods and medium, and so on, and be able to turn off the steam at a certain temperature for the coarser materials?—The weaving is not classified generally. I think the classification in weaving is only damask and plain. Of course, there are many dry sheds where they do a coarse kind of work, but in a factory where they use steam there is no classification of that kind.

3743. There is nothing at present?—I do not think so.

3744. No, there is not; but what I want to get at it, would it be possible to have a classification?—That is more a manufacturer's question. I could not answer that, I am afraid.

3745. Do you think it would be desirable from a health point of view?—It is very difficult to say.

3746. I think it is an accepted fact that working in a moist atmosphere at a high temperature is injurious to health. For that reason in Lancashire the steam is cut off at a certain point. If it can be done here for certain goods would it be desirable?—I should think so, certainly, if it would not make it more difficult for the workers to weave.

3747. Of course at present you have the finest goods and the coarsest goods, very often side by side. It is not a change that would take place in a day, or a month, or a year, perhaps; but eventually the factories might be so arranged that you would not have very high temperatures and excessive moisture where it was not necessary, so that the people working would not be subjected to conditions that are not necessary for their work?—Yes, of course that might be a great advantage; but it could not be applied under the present working conditions.

3748. Just one further point. Have you noticed that in many weaving sheds there is a large amount of condensation going on, and the water is dropping on the workers, and sometimes on the cloth—in fact, dropping more or less like rain in the sheds?—Yes, I have noticed that in several cases.

3749. Could you make any suggestion for improving that?—I think I have generally noticed it where there is a great deal of steam being introduced, and where there is more humidity used than is usually the case where fine weaving is being done. I do not know that I have any remedy to suggest.

3750. (*Professor Lorrain Smith.*) You said you had had seven complaints about the steam?—Seven complaints relating to high temperature and bad ventilation in weaving factories.

3751. What did these complaints refer to?—Close conditions—the general condition of the shed.

3752. Discomfort?—Discomfort, yes.

3753. Have you noticed that the moisture was especially complained about?—No, it was not the moisture in these particular cases—in fact, three of them, I think, were dry sheds—but the ventilation. There seemed to be a lack of air. The air I should describe as rather stagnant.

3754. You have had plenty of opportunity of hearing complaints?—Yes.

3755. May we say there must be very few complaints, or they would have reached you?—These are complaints that are written to me. In the course of visiting the factories I find the workers often speak of the heat. I do not count those as complaints.

3756. One is rather struck by the fact that in the linen weaving sheds they seem to say less about it than they do in the cotton sheds. Have you experience of cotton?—I have not experience of that kind in cotton. I have been in Ireland about 18 months. I have been really surprised they do not complain more of the conditions.

3757. How do you explain that?—I do not think the workers ever like to complain very much. They are rather frightened to complain. I think, probably, in Lancashire, or in parts where they are more highly organised, you always hear more complaints.

3758. You know the degree to which they complain in Lancashire that they propose to abolish steaming?—Yes, I have read the reports.

3759. There are very strong feelings about it. They describe it in most expressive terms?—Yes.

3760. Causing them intense discomfort and exhaustion. One is rather struck by the absence of that type of complaint in the linen sheds in the north of Ireland?—Yes, I have been rather struck with that, too.

3761. You do not offer any explanation of the difference?—Except that I think the highly organised and more highly educated workers in Lancashire would be more likely to complain.

3762. (*Chairman.*) Do you think the wage question has anything to do with it?—It is very difficult to say. I do not see how it affects the question of physical discomfort.

3763. It is this, you see. Supposing that, as I know to be the case, the weaver in Lancashire earns twice as much as the weaver in Belfast, and that the more moisture the better weaving, if you remove the moisture it is worse weaving and less money, would not the worker who is getting less money be disinclined to have that further reduced?—It might possibly be so.

3764. Do you know how many looms a worker looks after in this country?—Two

3765. And in Lancashire?—Four.

3766. Have you considered the wage question at all, what they get relatively?—No, I have not. It does not really concern me. Except as regards fines and deductions I do not inquire.

3767. (*Professor Petavel.*) What are the maximum temperatures you noticed in the spinning mills?—The maximum ones are 85° dry bulb and 83° wet bulb.

3768. That was summer?—No, 83° wet bulb was last week—October.

3769. The 85° and 83° are not connected; they are two separate maxima?—They are, as a matter of fact, connected in two instances; but I have constantly noticed 85°. I have only two 83° wet bulb. One was in July last year and one was in October—this month.

3770. Do the workers complain of exhaustion when these temperatures are prevalent? Have you spoken to the workers at the time these temperatures existed in the shed?—Yes; well, it was hardly necessary to speak; their discomfort was so obvious. They were perspiring very freely and they had a distressed look.

3771. You would be under the impression that it would affect their health?—I would, with that temperature.

3772. Have you considered the general question of clothing? Do you consider that what can be done is done by the workers to wear a sensible costume in view of the heat?—I think so, to some extent. Of course, that must depend very much on their economic conditions at home. In some cases I find the spinners wear very sensible blouses, without any collars. In some country mills I find them all wearing blouses of a uniform pattern, specially made for wearing in the spinning rooms, with the short sleeve and low neck. Very comfortable they looked.

3773. (*Chairman.*) Where was that?—It is difficult to remember at the moment.

3774. What I was thinking was perhaps we might make further inquiry when we were considering this clothing question. If it should come back to your memory you might let us know.

3775. (*Professor Petavel.*) Do you consider the clothing question an important one?—It is an important one, but I think it must be left to the individual. I do not think you can legislate except as regards the covering.

3776. Could anything be done by educational lectures, or something of that kind—advice, either from the employers or from any society that felt inclined to take up that kind of work?—It might, certainly; it might be a help to advise them not to be too heavily clad in the spinning rooms.

3777. And arrangements made for them to change, or partly change, before leaving the spinning room?—I do not think it would be very practical. I think many of them would not like it. You would have to have a regular cloak-room for anything of that kind, and then I think there would be workers who would not care for others to see what they were wearing.

(*Professor Lorrain Smith.*) It would be easier if you had a regular, recognised dress?

(*Chairman.*) You mean an overall?

3778. (*Professor Lorrain Smith.*) Yes?—Yes. The difficulty comes in about having something that gets wet. You do not want to put them into a sacking overall; it would be much too hot.

3779. (*Professor Petavel.*) If it was used as an overall; but if it was to replace some of their exterior garments it need not be hot?—No. Then you would have to have the apron on the top.

3780. We heard on one occasion that girls suffered from sore feet owing to walking about in the mill with bare feet. Have you ever come across cases of that kind?—No, I have not personally. I have heard of them.

3781. It is not frequent?—No. At least it has not been frequently brought to my knowledge.

3782. Have you noted any of the maximum temperatures in the weaving sheds?—I have noted them, but I have not got them here. In these particular places about which I had complaints I happen to remember that they were not excessively high temperatures. It was rather the lack of air that was complained about; but I have, of course, occasionally, found high temperatures, and in one or two cases a difference of barely two degrees between the wet and dry bulbs. Perhaps one and a half; but in very few instances.

3783. You have, of course, experience with a number of factories. Do you consider the workers in weaving sheds or spinning rooms are under worse or less healthy conditions than the average industrial population?—It is a very difficult question. I should have said so, from looking at the conditions, especially in a bad spinning room; but I have very little evidence that there is more illness or more disease amongst them; and, of course, these workers in spinning rooms are rather the lowest class of worker. The weaver is socially more the same class as the warehouse girl—the girl who goes into the making-up factories.

3784. (*Mr. Cummins.*) Speaking of the difference between the Lancashire weaver and the Irish weaver, as regards humidity and ventilation, the one is organised and educated on humidity and ventilation, whereas in Ireland you would not get one weaver out of a hundred who would know the meaning of the word humidity?—No, that is very true; and they can hardly ever tell me where the thermometer is hanging. If I go straight into a shed, as I often do, and ask a worker, they do not know what I mean. They cannot tell me where the thermometer hangs.

3785. (*Professor Petavel.*) They feel the discomfort, but do not know what it is due to?—Yes, that is it.

3786. (*Mr. Ewart.*) Have you ever noticed the weavers knowing enough to add to the humidity? Have you ever seen them spilling water under their looms?—I have never seen it.

3787. (*Chairman.*) Do you think it would be a desirable thing for our Committee to make some recommendation in regard to this clothing question, which is one that will have to be settled one way or another? Do you consider it would be desirable for our Committee to suggest that, in conjunction, say, with the Principal Lady Inspector, and, perhaps, yourself, and some practical weavers whom you might select, to make some recommendations on that point? It seems to me this question of the clothing for women is so essentially one that might be better dealt with by ladies than by us, that you might make some suggestion of that sort?—Do you mean the ordinary personal clothing of the worker?

3788. No, I do not think you could interfere with the personal clothing of the worker; but I am dealing rather with a measure of protection for the spinning rooms, such as we have now; but what we have now is not satisfactory. The bibs are not worn; the india-rubber is said to prevent free perspiration and freedom of action, and generally speaking the present arrangements are unsatisfactory. Now, where there are not splashguards we want to improve upon those conditions; and I am rather of opinion that, where the measure of protection is for women, the ladies would be best able to make some recommendation on the point?—Certainly, as regards some substitute for the waterproof.

3789. For the waterproof and for the bib?—Yes.

3790. At present the Regulations say, "*Efficient* " *splashguards shall be provided and maintained on all* " *wet spinning frames of two-and-three-quarter-inch* " *pitch and over*"—well, we have your suggestion on that point—"*and on all other wet spinning frames* " *unless waterproof skirts and bibs of suitable material* " *are provided by the occupier and worn by the* " *workers.*" Now the state of things is this at present. The waterproof skirts of suitable material are provided, but the law says they shall be worn by the workers. As a matter of fact they are not worn by the workers, and consequently there should be a splashguard on every frame in Ireland under the present state of the law?—Yes. The waterproof aprons are largely worn.

3791. A great many people have been complaining about not having splashguards and not having protection for the workers, and so on. Under the present law there is power to have splashguards on every frame unless things are not only provided but worn. As a matter of fact they are not worn?—The waterproof aprons are worn.

3792. But not the bibs?—Not the bibs, no.

3793. We want to change that and to have something that will not only be law, but will be carried out?—Yes. I can only suggest, at the moment, a suitable material is kind of canvas.

3794. You see we have a suitable material now?—Yes, waterproof, but it is the word "*waterproof*" that is the difficulty now.

3795. And the bibs of suitable material?—Yes, that is the difficulty, with the word "*waterproof.*" I think, if you omit the word "*waterproof*" and get guards on more of the frames, the other would be found a sufficient protection.

3796. Is there anything else you would like to say?—The only other thing I would say is—though I am not sure it would come within your consideration—I do find the workers appreciate enormously some kind of seat, especially the weavers. The spinner and winders have also asked for them. I had an anonymous letter the other day asking me why, when I went round these places, I did not look for the seats for the workers.

3797. Was that in the winding room?—Yes, I think that referred to winding. Of course in some weaving sheds they are provided, and in a very simple form—just a leather strap which they sling on to their loom, and I find they are really very comfortable.

3798. It has been suggested to us before, and the question has been whether they could use them and do their work?—Well, they do use them.

3799. They do?—Yes, at odd minutes, and appreciate them enormously.

3800. Could you refer us to any place where we could see them?—Yes, the straps are very much used in the New Northern Mill.

3801. The New Northern Spinning Company?—Yes.

3802. In the weaving sheds?—The seats are used in Mr. Ewart's mill in the Crumlin Road. Those are seats on the looms, I think.

(*Mr. Ewart.*) Yes.

The witness withdrew.

Mr. J—— M—— called and examined.

3803. (*Chairman.*) What are you by trade?—A weaver.

3804. How long have you been a weaver?—About 18 years.

3805. And where are you working now?—At the Portadown Weaving Company—Mr. Greeves' place.

3806. Mr. Greeves wrote me a letter and said he thought some of the weavers would like to express their views. We suggested he should send two representative weavers, and I presume you are one of the two?—Yes.

3807. I think, before asking you questions, I would rather just hear what you would like to tell us?—It is only the damp; the humidity, you want to know?

3808. I want to know your views, what you think?—My experience is we cannot very well weave with any less damp than what is at present allowed. In fact, on certain days, a dry, windy day, you would require a little more even than what the law allows.

3809. That is two degrees difference?—Yes, between the wet and dry.

3810. What goods are you manufacturing?—Cambric and fine linen.

3811. Is it all cambric in that shed?—Very near all, with the exception of a very odd linen. Of course, there is no cotton, I mean.

3812. No, but is it all fine cambric?—Yes, sir.

3813. There is no coarse in that shed, or medium?—Well, there is some coarse, but they are not what you call the real coarse stuff. They go down to about 13°°. That is considered in a fine factory the coarse stuff, but there is what you call coarse factories, and that would be called a fine one in a coarse factory.

3814. (*Professor Petavel.*) What is the finest you make?—About a 13°°.

3815. The finest?—Oh, the finest; 24°°.

3816. (*Chairman.*) Have you worked all your time in this shed?—No, I have not; but I have worked for the last nine or ten years.

3817. Where did you work before?—I worked in a coarse factory.

3818. Had you any difficulty about weaving there?—No, none whatever. The humidity had not the same effect. You do not require the same amount of humidity in a coarse factory as you would in a very fine factory. It would not matter so much whether you had much or little.

3819. In a coarse factory it does not matter whether you have much or little?—Not so much.

3820. Where does it begin to get important that you should have plenty of humidity?—Well, I would say about 69° wet would make a good weave.

3821. (*Professor Petavel.*) At what sets?—For fine stuff 13° up to 24°.

3822. For all these sets, even for 13°°?—Yes—well, the finer it is it would require more, of course. It has more effect on the fine stuff.

3823. (*Professor Lorrain Smith.*) Could you do a 13°° without the damp?—Well, I would not say so. I would think you could do better with less damp on a very coarse one than you could with a fine one, in fact you could not weave a fine one without it.

3824. (*Chairman.*) You think that a difference of two degrees is necessary for efficient weaving for the class of work you are doing?—I do.

3825. Now look at it from another point of view. How does it affect your health?—Well, I would say if it was possible to weave with less it would be better for my health. In fact I could not say that it is good for my health, or that it is as good for my health as if I had none, for my own personal experience is that it does affect my health. If you would come out on a very hot summer afternoon you would just fancy you had a warm bath, but in winter time there is no difficulty.

3826. Then in the summer you feel exhausted over your work, and tired out?—I do, yes, when it goes to about 75° and upwards.

3827. Can you tell us if any means are taken to cool your shed; I mean to say, in the very hot summer days, are there any special means for cooling it?—I could not suggest any, sir, because I have not troubled myself in thinking anything out that would cool it in any way; but I would say if it was possible to get more fresh air in it would be a great help. I believe a lot in the fresh air, because it seems as if the place was all stuffed, and you have difficulty in breathing on a very, very hot day in summer.

3828. If you kept on changing the air, you would not get the humidity?—No, you would not.

3829. So there is a difficulty about getting what you suggest, the fresh air?—Quite so.

3830. But how do you humidify; is it by live steam or by humidifiers?—Well, it is damped by a process I never saw before. It comes along the alleys and the steam comes up from the floor. In some firms they have it above and it blows out live steam from pipes; but in this place I do not know, indeed, what way they put it in, but it comes up from the floor.

3831. As a rule they have been sprayed in your time?—On special occasions on a very hot summer.

3832. That is sending water on the roof?—No, they spray it with water from a can on the floor.

3833. (*Mr. Ewart.*) On the floor? We are speaking of the roof?—No, not that I know of.

3834. (*Chairman.*) Is the roof white-washed?—Yes.

3835. Do you think the comfort and the health of the workers would be improved if by any means the temperature of the shed could be brought down in the summer?—No, I do not know of any, but I would certainly appreciate it if it could be.

3836. That is what I say. Supposing that it could be done—we are not going to say it can be done or cannot be done—but supposing something could be done to make the shed cooler, would that be better for the workers?—It would, a lot better. The workers would appreciate it very much; but they protest against the reduction of the damp simply because they are afraid of not being able to work the yarn as well, and therefore earn less wages.

3837 They would earn less wages?—Yes, if there is a bad weave. Say there was an east wind like last Monday and Tuesday, even with the allowance that the law allows there is not sufficient, and you have more breakages, and therefore you make less wages; but with a wet, muggy day, what the law allows is above sufficient It seems to me the whole thing depends largely on the weather.

3838 (*Mr. Ewart.*) How many looms do you drive?—Two, sir.

3839. Are they near the main door, or are they away in a still corner? Do you ever work looms near a door?—No

3840. Then you do not know what the effect of a movement of the air is?—No. The part I work in is, I suppose, 50 yards from the door, but it is not in a corner, neither in the centre of the shop. It is, you might say, rather out of the one corner.

3841. You would not feel the effect of a draught from the door every time it is opened?—No.

3842. (*Professor Petavel*) What sets are you weaving yourself?—At the present time?

3843. You are a fine weaver, are you?—Well, I never work under 17^{00}—from 17^{00} to 23^{00}.

3844 With the 23^{00} has it ever occurred that you have had too much damp, and found the threads sticking to the back shell?—Yes, I have experienced that; but it is only when there is excess of damp on, but it is very seldom that. There are times when the humidity is abused, according to what I hear, in other firms, and the workers seem to say nothing about it, but in the place I work in myself I can say this confidently, that they look after the damp remarkably well

3845 If, as you request the amount of humidity allowed was made greater, do not you think you would have difficulty with the finer sets?—I think the present allowance is quite sufficient, except, as I say, for a dry, windy, cold day. I believe the present allowance is quite sufficient provided, as I said before, that we were allowed more on a windy, cold day It is very difficult to work on bad weaving days even with the allowance that is allowed on damp days.

3846 We have heard that weavers find it a great comfort to have seats provided for them. Would there be much opportunity of using a seat if there was a seat provided?—I do not know, sir. I could not say.

3847. Would you look upon it as an improvement yourself to have a seat? If there was a seat between the two looms do you think it would be an improvement?—Yes, but to tell you the honest truth, even though there was a seat I should not have time to sit down. I am kept going all the time It certainly would be a great help and ease, but if you have to mind two fine looms you have not time to sit. In fact you have more to do than you can do at times.

3848. (*Professor Lorrain Smith.*) You spoke of the bad weaving days, with the east wind, and you were telling us about the difficulty of weaving on the days when there is a east wind?—Yes.

3849. What does that amount to? How would that affect your wages?—Well, you see, where you would have five breakages in your warp, if it was a good day you would not have one compared with five.

3850 But how does it affect the wages? How much less would it amount to?—Well, I would say it would affect them 15 per cent. if it was a bad week all through. If it was that kind of weather you would have, I should say, 15 per cent. less wages that week——

3851. Than you would in a week with a west wind?—Yes.

3852. Then, it is to get over that difficulty you want a little more steam?—You would require a little more.

3853. (*Mr. Cummins.*) You said you had heard of the steam being abused in other factories—going beyond the Act—but it was never abused in your place, and properly looked after. Have you been in the habit of taking readings?—Yes—in our own place?

3854. Yes?—The glass is very convenient to me; but I will not say for a fact that it is abused in other firms. It is what I hear from other weavers. The other weavers tell me in some firms you could not see each other on a very frosty morning for the humidity that is flying through the shop.

The witness withdrew.

Mr. J—— C—— called and examined.

3855 (*Chairman.*) What are you?—I am a weaver.

3856. How long have you been a weaver?—Ten ears and about three months.

3857. Have you worked in this shed all the time?—No.

3858. How long have you worked in this shed?—Three and a half years

3859 That is in the Portadown Weaving Company?—Yes

3860. You weave very fine material?—Yes, from 17's and 18's upwards

3861. That is cambric?—Yes

3862. And you have formed some opinions, I suppose, about whether artificial humidity is a good thing or a bad thing?—I have.

3863. What do you think about it?—Well, I think it could not be really done without at all, and I think that there are days when we could do with more than what we get, really.

3864. The limit now is two degrees, I think?—Yes.

3865. Two degrees between the wet and dry bulb?—Yes.

3866. Can you do your work properly with that?—Well, that is according to the weather just. There are some days you could do with that, and other days, according to the weather conditions, when you could not do with it at all.

3867. You would like to be a bit closer?—We should like to be a bit closer on some days.

3868. As a matter of fact, you do not go any closer so we understand?—No.

3869 Then does your weaving suffer?—It does.

3870. On certain days?—On certain days, according to the weather

3871. Now to what extent?—Well, on a very windy day outside, and rough, the heat would not be so great inside, and therefore you would not get near as much done. Your warp would break far more.

3872. And you would weave less, and get less money?—You would, certainly, because if it took you three days doing 80 yards of cloth, it might take you four if the weather was bad weaving weather, and you would be at a loss, certainly.

3873. How many days a month do you suffer that way, taking an average?—It would be very hard to say that .

3874. You could not just say exactly, of course, but, from memory, how many bad days in a month would you have?—Some weeks one, and some two

3875. One or two in a month?—In a month, I would say three or four.

3876. Supposing you got three or four days in a month, how much will that reduce your wages—say four days?—It is according to the class of stuff you have in. If you have in 2100 at 8*s*, you could do that in three days, but say it took you four, you would be at a loss of about 6*d*. a day.

3877. In a month?—A week. If you had 2100 at about 8s., and you could do that in three days; if it was breaking extra, it would take you four days near

3878. That would be 3s. 6d. off your week's wages?—Very near

3879. What would your average week's wages be about?—On an average, I make from about 15s. and 16s. weekly—the year round.

3880. There would be four days you would lose 3s. 6d. out of that?—I do not say 3s. 6d. in the week I say on that cut you would lose about 6d. a day—about 1s. 6d. on that cut that week

3881. That would be four days in a month would be about an average.

(*Professor Lorrain Smith.*) If he had a three days' job and it took him four days to do it, he would therefore lose 1s. 6d.

3882–3. (*Chairman.*) I asked him before if he could estimate how many days a month he lost. I think he said four days in a month?—I said about four days. I cannot estimate. You do not know what comes about.

3884. That would be about 3s. a month—something of that sort?

(*Professor Lorrain Smith*). Something of that.

3885. (*Chairman.*) You have told us—and I think probably your views are much the same as other weavers doing your work—that this moisture helps you in your work?—It certainly does in fine yarn.

3886. That we accept as an accurate statement. Now will you tell us how it affects your health?—As far as I am concerned I never was off a day thie ten years. I have had the best of health. I can safely say I was not off one day those ten years through ill-health. I was never off until now.

3887. On a very hot day in summer do you feel very tired from your work?—No, I never felt tired, but I could not speak for other people. There are other people delicate. It would affect them far more than me.

3888. We only asked you about yourself?—I never felt very tired after six o'clock. You might be sweating a bit, but you would not feel it very much.

3889. Do you find the work more exhausting in the summer than in the winter?—It certainly is.

3890. You would feel more tired in the summer?—You would, but at the same time there would be more breakages in the winter, but you do not feel the exhaustion nearly as much.

3891. (*Professor Lorrain Smith.*) Are you a great cyclist?—No.

3892. Do you play football?—I do.

3893. Do you feel quite equal to it?—Certainly.

3894. How much do you play?—Well, every Saturday evening nearly we have a match.

3895. You never go home too tired to be troubled with football?—Many a time I would be tired after cycling.

3896. Do you ever go home from your work too tired to think of having a ride on the bicycle or having a game of football?—I do not.

3897. We hear of people going home from working in these humid atmospheres so exhausted that they are disinclined to do anything—disinclined for food. You have no experience of that sort?—Never, but I daresay other people have.

3898. (*Chairman.*) Are there women weavers in your shed?—Yes.

3899. In what proportion to the men?—Well, about half.

3900. Do they make the same wages as men?—Certainly, they get the same stuff and just make the same wages. They have the same amount of money for their work.

3901. (*Professor Lorrain Smith.*) How would you speak about your neighbours: are they most of them as strong as you are?—No, they are not all just as strong as I am.

3902. No, but are they fairly healthy; and they do not feel over-exhausted?—Yes, a lot of them look all right, but then there are others that are never well, no matter where they would be.

2903. So those that are strong do not suffer, and those that are naturally weak feel the exhaustion?—Certainly.

3904. (*Professor Petavel.*) When reading the papers have you noticed that the Lancashire weavers have all asked for the abolition of damp?—I did. I have seen that in the paper.

3905. You have read of that?—Yes.

3906. That is very different from your view, is it not?—It is very different indeed

3907. Can you explain the difference?—Well, I certainly can to some extent. Theirs is mostly all cotton work, and ours is all cambric work; and there is a big difference between a cotton warp thread and a cambric one, because cotton thread will stretch and linen thread will not.

3908. But as far as the effect on the health of the weavers is concerned is there any reason for it affecting the Irish worker in a different way to the Lancashire worker?—I do not know. Do they get the same amount of humidity that we have?

3909. They get less?—Well, it requires less for them, of course. I could not say. I never was there. I do not know what their experience would be. A workman there could tell you.

3910. (*Mr. Cummins.*) Whenever you go out in the summer nights does your shirt not be wet?—Many a time

3911. And when you go out do you feel chilly?—We certainly would if it was a cold night, but in the summer time you would not feel it so much at night going out. The other night my shirt was really wet with sweat

3912. What was the effect when you went out?—I never looked behind me. Away I went off to my amusement. It never annoyed me a bit.

3913. You say you can weave a 21^{00} in three days? What would be the pick for it?—I could not tell you that.

3914. It would take a loom to go very fast to weave a 21^{00} in three days?—It can be done in three days at times.

3915. I have never seen it done; that is the reason I ask.

The witness withdrew

Mr. JOHN MILLER ANDREWS called and examined

3916. (*Chairman.*) What firm do you represent?—John Andrews & Company, Limited, of Comber.

3917. You are spinners?—Flax and tow spinners.

3918. What class?—We spin high-class warp line yarns and high-class combed tows

3919. Do you claim in any of your rooms the exemption on the ground that you do not get within four degrees?—No, we claim no exemption.

3920. (*Professor Petavel.*) What are your finest counts?—Our finest counts are 140's.

3921. (*Chairman.*) I think you have prepared a statement?—I have a short one.

3922. Perhaps you would be kind enough to read that statement.

Statement in reference to the question of temperature and humidity of wet spinning rooms, and also to the difficulty of fitting splash-boards to spinning frames under certain necessary conditions.

I am of opinion that every one connected with the flax spinning trade will candidly admit that the atmospheric condition of spinning rooms is unsatisfactory, and that there are few, if any, who would not be willing to spend a large sum of money in order to instal an approved system of ventilation.

Unfortunately, flax yarns require to be spun in an atmosphere somewhere between 70 and 80 degrees, according to the quality of the yarn and tea, and also *in an atmosphere containing a considerable amount of humidity. These conditions, however, are, in my experience, not seriously injurious to health. Very few of those engaged in spinning rooms suffer from chest complaints as is the case in a dusty atmosphere; but, at the same time, admittedly the conditions are unpleasant, and everything possible should be done, in my opinion, to improve them. The difficulties to be overcome, however, are much greater than those which existed in the hackling department and preparing rooms in connection with flax spinning mills, where such an enormous amount has been accomplished by exhaust and inlet ventilation to improve conditions.*

The chief difficulties in connection with spinning room ventilation are as follows.—

(a) *Water troughs require to be kept at a temperature of from 120 to 170 degrees, according to the fineness of the yarn and the amount of time which it is in the trough. This is essential so that the natural gum of the fibre may be dissolved.*

(b) *The rollers by which the fibre is drawn after it has passed through the troughs require to be warm and moist, so that it may spin properly; and in the case of high-quality yarns water-drips have to be used in order to keep the rollers free from an accumulation of this gummy substance and small fibres.*

These conditions being necessary, the problem appears to be how they can be left unaffected and yet the general atmospheric conditions improved. I am of opinion that this will not be accomplished in the most efficient way without a great deal of experimental work, and I think a grant might be advantageously given for this purpose, as I understand was done in the cotton industry.

As regards the question of splash boards, admittedly where they can be applied they keep the workers and floors somewhat drier, but I am of opinion that where the floors are properly laid with a good quality of tiles sloping towards metal channels, the difference is more sentimental than real.

Where ends are "laid on" in the case of high-class yarns, and where the spindles and rollers are required to run fast, the application of splash-boards is impossible, for the following reason, namely, that the girls are obliged to use the knee to stop and prevent the spindle revolving while they are giving with their hands the necessary twist to the rove to enable it to spin. All splash-boards designed up to the present make it impossible for the girl to reach the "butt" of the spindle with her knee, and, therefore, if splash-boards were adopted speeds would require to be considerably reduced, which would enormously increase the cost of spinning high-class yarns.

JOHN M. ANDREWS

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3923. (*Chairman.*) You say the yarns require to be spun in an atmosphere somewhere between 70° and 80°. I do not think our investigations will quite support that?—I do not say all classes of yarns. I do not pretend to speak for the trade. I have no right to presume to speak for the trade, but I know that our class of warp yarns require somewhere between this minimum and maximum temperature. In connection with high-class warp yarns the difficulty is this: they are spun on particularly short drafts, they are spun double rove, and the consequence is they are a very short time in the trough, and the trough requires to be kept hotter than would otherwise be the case in order that the natural gum which is in the fibre will be dissolved in the short time available. I think I am right in saying some of these yarns go through the trough in about 16 seconds, especially where the yarn is coarse and the draft is short.

3924. Do you, in the winter, keep the temperature between 70 and 80 degrees?—Yes.

3925. (*Professor Lorrain Smith.*) That is the temperature of the trough, is it?—No, that is not the temperature of the trough. The temperature of the trough I deal with further on. According to the class of yarn, both as regards quality and lea—they are both affected very considerably—the temperature of the trough would run from 120° to 170°.

3926. (*Chairman.*) I gather you keep it between 70° and 80° even in winter?—Even in winter, yes.

3927. Is that wet or dry bulb?—You see, there is not such an enormous difference. There would be about five degrees of a difference; and I think you might take it it would run between that with either.

3928. I am just raising that point, but I do not want to go into it now, because we shall have to look up our evidence and see how far the evidence supports that statement generally?—Yes. Of course, I would ask you, sir, to bear in mind that in this flax spinning trade (as I am sure you are already aware) there are very different conditions. If you take it that the rove is going through a trough slowly, according to the quality and fineness of the yarn, you can consequently keep that trough a good deal cooler than where the yarn runs through at a very quick rate.

3929. We shall have, of course, to compare, as far as we can, temperatures that we have seen and had before us in evidence, bearing in mind the quality of the yarn?—Yes.

3930. Of course, I am not disputing this; but I say it is a point we shall have to look into?—Yes.

3931. You think 70° to 80° is not seriously injurious to health?—Well, I think the results show that it is so. I know that our spinning-room hands as a whole have very good health.

3932. You go on to say: "*Very few of those engaged* "*in spinning rooms suffer from chest complaints, as is* "*the case in a dusty atmosphere, but, at the same time* "*admittedly the conditions are unpleasant, and every-*" *thing possible should be done, in my opinion, to improve* "*them.*" Of course, we know that in the spinning rooms you would not expect to find dust?—No, there is no dust in spinning rooms.

3933. That, I think, we shall agree upon. The whole of our evidence goes to prove that in the North of Ireland, an extraordinary amount has been done in that respect?—Marvellous.

3934. I gather you think there is room for improvement in regard to the drainage of the floors?—I do certainly think the floor drainage could be improved in some instances.

3935. "*Where ends are laid on in the case of high* "*class yarns, and where the spindles and rollers are* "*required to run fast, the application of splash-boards* "*is impossible, for the following reason, namely, that* "*the girls are obliged to use the knee to stop and* "*prevent the spindle revolving*"?—I think I should put in the word "*commercially*" impossible. It is not impossible. You can reduce speed of the spindles to an amount that will allow that to be done.

3936. In Scotland we had evidence that there were a lot of Belfast weavers in the Scottish mills, and our evidence there was that they could lay on very well indeed.—Well, it depends on several conditions. One condition is the speed at which the spindle runs. If you are spinning a high-class yarn, where the spin is what is known to be good you can run a spindle a great deal quicker than if you are working a poor-class yarn. That is one thing that affects it materially. Another thing that does it is this, the weight of the spindle flyer and bobbin to be dealt with. You can understand if you are spinning a very fine yarn like Greeves spin the spindle may run pretty fast, but it is a very light spindle and a very light bobbin and flyer, and consequently easily stopped. But if there is a spindle running fast and at the same time it is very heavy, it is practically impossible for a girl to stop that with her hand and at the same time use her two hands in order to give the rove the necessary twist to get it on to the bobbin. The way she does it is, she puts her knee against the spindle, stops the spindle with the knee and when she has it stopped she has her two hands free and she gives the rove a twist between the palms of her hands, and "lays on" the end on bobbin. If you have a slow-running spindle, as you would have with a poor class of yarn, and have a light flyer and bobbin and spindle as you would have in a fine yarn, then it is possible.

3937. Your point is you would have to reduce the speed of the spindle?—Yes, to a very considerable extent

3938. (*Professor Petavel.*) I take it from your last statement that the splash-guards would be no inconvenience in the case of a poor yarn or a light yarn?—I would not say that The hands would bear me out. Splash-guards are always an inconvenience. I am speaking from practical knowledge of it, having served my apprenticeship with the workers, and I think there is no hand who would be favourable to a splash-board if she is left to herself; but, at the same time, you can work them without a very great deal of inconvenience under certain conditions. Under the conditions I have named it makes it commercially impossible I would like you to understand that it is my considered opinion that the hands, who ought to know, very much prefer that splash-boards should not be adopted In fact, I know there is not one of our hands would like them even on some frames where we do not lay the ends on. In the case of combed tow yarns, even where it is not necessary to lay ends on, the hands would very much object to splash-boards being put on. It is very much more than a prejudice. The hand has to do her work with them on in a different way altogether. When she is dealing with her bobbins she wants to come down like that to them (*illustrating*). When a splash-board is on, she has to deal with it that way (*illustrating*). A young hand might be brought up to feel the inconvenience less, but an older hand who has always been doing without it would feel it very much the same way as you would feel it if something was put below your arm when writing and cocked your arm up like that.

3939. That refers, of course, to your hands at your mill. It would not be the feeling in Scotland?—I know nothing about the Scotch trade, but it applies to more mills than my own mill. I served my time in a different mill to our own mill, and certainly the hands there were just as strongly opposed to splash-boards as they are in my mill.

3940. Your statement that high temperature and high moisture of the air is required is rather contradictory to some evidence we have had before us What special features have you in your trade which are not general?—Well, again, when you are dealing with a high-class yarn you have got the quick-running rove because of the short drafts, and the consequence is, as I said before, you have got to bring that rove through that trough at a tremendously quick rate, with the result that you have to keep the trough hotter than you would otherwise keep it.

3941. That I was coming to later, but you were saying 70° or 80° of an air temperature with considerable moisture. What justifies the difference in your evidence on this point from the evidence we have received elsewhere? Is your trade different?—In some respects. Our trade is both a high-class yarn, and a great deal of it is fine yarn, and where you have a fine yarn it is far more sensitive to any little chill in the temperature than it would be if it was a coarse yarn, because it is more affected by the temperature in proportion to its size; there is so much of it exposed. Take a fine weft yarn. You simply could not spin it if the temperature was low.

3942. And the moisture?—Nor in a dry atmosphere, and the proof of that is this. It has always been said that one reason that Belfast has been so successful in flax spinning is the fact that we have a great advantage as regards the climate. The dampness of our climate is particularly suitable for spinning yarns, especially fine yarns. In America it is nearly impossible to spin fine yarns, owing to there being long periods of frost. They have to spin coarse yarns and can spin coarse yarns moderately successfully.

3943. You stated your finest yarn was 140?—Yes, that is so.

3944. How would you account for the fact that we have seen in a certain mill seven degrees between the thermometers, in a room where they were spinning over 200's numbers higher than 200?—Again that would possibly be a room where the number was fine but at the same time where the drafts were not excessively short, and where the period in the trough may be twice as long as it would be in our particular case. For instance, a finer room does not necessarily mean a cold room, nor does a coarse room necessarily mean a hot room. It depends on other conditions besides the lea

3945. Yes, but in the same place the statement was made that the temperature of the room was not very important?—Yes; well, I do not mind whether that statement is made or not. It is not correct as regards some classes of yarn You will find a particular man may make that particular statement, but you will find the average opinion of the trade of practical men would not hold that view. In fact, I may tell you that what everybody knows is this· the worst time you get of the whole week for spinners to get their work done is a Monday morning, and the reason that a Monday morning is a bad morning is because everything is cold about the room, although, mind you, the temperature will be up to 70° but the machinery is cold and the atmosphere is colder than it is under ordinary working conditions. After a stoppage the same thing applies to a certain extent, a holiday, when the room is cold. You will get more hands stopping out of a Monday morning than any other morning. I do not say entirely because of the worse spin, but partly due to the fact that the spin is worse on a Monday. If they are going to take a morning off it will be Monday morning because they do not want to face, where poor yarns are being spun, the bad spin. I think that is better than a mere theoretical statement. It is a fact you can make deductions from.

3946 Now you refer to the yarn running through the trough at a quick rate and hence a high temperature in the trough being necessary?—Yes.

3947. Would not it be possible to lengthen the run of the yarn through the trough by, for instance, doubling it, or some other device, and thus avoid the high temperature?—We do that to a very large extent. The troughs are made like this. The creel comes over like that and the bobbins sit up like this. (*The witness illustrated by a sketch*). As a matter of fact, the rove would require to be twisted very much harder and it would be a very costly thing and lessen your production on the roving frames to a very considerable extent. Another reason is the harder you twist the rove the less likely it is to absorb the water, and it would be very nearly impossible for a girl to get it through the trough, as suggested. You remember that water is 120° at least. It is not easy for a girl to put her hand in that water and draw it up through that and take it back this way For our own benefit, we go as far as I think practically possible, and I think every other mill does the same. You do not want the heat of the trough hotter than necessary. It costs money to heat the trough.

3948 (*Mr. Ewart.*) I think Mr. Andrews is talking about a very different type of yarn from what you saw spinning in Scotland. What is the finest they go to in Scotland?—I really could not speak with certainty. Certainly it is not the same class of yarn.

3949. (*Secretary.*) 40's to 90's at one place, occasionally 250's?—Very occasionally. I never heard of it.

3950. The ordinary thing is 40's to 90's?—That would only be a number of frames. They would not have a room like that.

3951. Not above 50's?—No, that is a very different class of yarn altogether.

3952. (*Chairman.*) You consider it desirable to maintain the temperature of your particular work at from 70° to 80°?—Yes.

3953. Now we have the medical reports coming in for Ireland. They will be very exhaustive, and when we get them we have reason to believe they will be very instructive. So we have yet to learn the physiological effect of working in high temperatures in flax mills Although we have no reason to believe so far that the physiological conditions will be different from what they would be in a cotton mill, of course we know the working conditions are quite different. But we are now talking of the health conditions. You have seen in our evidence, I expect, that the medical men are of opinion that at 75° wet bulb bodily discomfort begins, and that when you get higher then injury to health follows. Now, supposing the Committee should think it desirable to make some recommendations in regard to better ventilation for spinning rooms, at what temperature would you suggest these regulations should begin to apply? Personally speaking at the moment, I do not see there is much use in interfering until the evidence shows that it is necessary for health. Now, have you any suggestion to make? I do not know in the least what the Committee may suggest, but supposing they did suggest better methods of ventilation, at what temperature wet bulb would you suggest they should begin?—Well, in the first place I would like to say that it is a flax spinner's interest, as regards their hands, to have it as low as is practically possible because we admit that the conditions in a spinning room are such that it rather tends to prevent workers choosing it as an occupation, and from that standpoint the lower it could be fixed the better. I advisedly say as low as is practically possible, and I do not think you can fix a standard to apply to all classes of yarn or to all mills because you might fix, we will say for mill "A" that it should be 75°. That might be no injustice or injury to mill "A," but, on the other hand, if you fix that for mill "B," it might be disastrous to them. I have worked in weft mills as well as in warp mills, and I know there is the very greatest difficulty. I have no right to speak for weft mills except you asked the question and I must answer it. We do not spin wefts ourselves, but I served my time where a good class of weft was spun, and even where a good class of weft is spun, if you fix, say, 75° I do not believe the hands could work the yarn, especially where there is a sharp frosty air. I do not think the hands would or could work the yarn. I believe very frequently they would "turn out," and they simply would not do it unless the speed of the frame was enormously reduced, and if you reduce the speed of the frame considerably you place us in a very unfavourable position to compete with foreign spinners.

3954. You understand it is the temperature of the room I am talking about?—Yes, I am dealing with the temperature too.

3955. Can you point to any place in the whole trade where there has ever been any difficulty in spinning at a temperature of 75° wet bulb?—Yes. I do not know whether I have the right to name places, but I certainly know places. We would have difficulty in our fine room ourselves, but others would have a greater difficulty, I admit, than we would have, because our class of yarn is particularly good. Therefore it will spin under unfavourable conditions when a poorer class of yarn would not spin at all.

3956. (*Professor Lorrain Smith.*) Is not that a figure you gave, between 70° and 80°?—Yes, but I want you to understand that entirely deals with our own concern. That is my opinion affecting our own concern. The reason I put it at 70° to 80° is that whereas we might be able to do with 75° under favourable conditions, it does not say that everybody could do it.

3957. But 70° to 80°; it is not 75°?—Yes, it includes 75°.

3958. That gives 75° as an average figure. Do you mean to say that is an impossible figure to work at on a frosty morning?—I certainly do, without hesitation. I do not say that it would be so for all mills, but I say for certain mills it would be.

3959. (*Mr. Ewart.*) On a frosty morning you desire a higher temperature than on a soft morning?—Yes, because in all probability the humidity would not be as much, and where you have that sharp dry air you have to get round it in some way and a little more heat helps. There are four things that will make a bad spin—1st, bad flax; 2nd, quick driving; 3rd, want of humidity, and 4th, low temperature.

3960. (*Chairman.*) Of course, you are speaking from your experience, and we have had evidence from various other sources. We shall have to weigh your evidence with the others?—Yes. Doctors differ and patients die.

3961. (*Professor Lorrain Smith.*) What does a considerable amount of humidity mean? Has Mr. Andrews told you what that means?—No, I have not. For instance, take a preparing room. If you go above six degrees difference between wet and dry bulb you would get a "lick up," probably. If you have five degrees, you will have no lick up. If you have seven degrees or eight degrees, you would have so much lick up that you would make a very bad yarn. That is dealing with a preparing room. In a spinning room more humidity still is required, owing to speed and fineness of thread.

3962. When we speak of four degrees apart, which bulb is the 75° in that case? Do you want 79° dry bulb and 75° wet, or 75° dry and 77° wet?—Yes, 79° and 75° would be the way I would want it. Of course, I would warn you against the danger of fixing a standard, because, if I may repeat what is my opinion from a practical standpoint, a standard that would be right for one mill would be very far wrong for another mill. If I might presume to suggest it, I think one recommendation might be that expeiments should be made in reference to how spinning rooms could be best ventilated. I think a great deal might be done in that way, and I think if the air was conditioned before it came into the room so as to get over the difficulty of a frosty air by damping the air a little bit and heating it a bit before it came into the room, the same as is done in preparing rooms, you might produce conditions that would allow a lower temperature on these particular occasions, but I think to begin to fix a standard until a great deal of experimental work was done would be a very dangerous thing, and might place some mills in a very serious difficulty with their workers, which is an important matter.

3963. I gather your idea is if the frosty air comes directly into the room, you have to keep the temperature higher?—You have.

3964. You cannot get at conditions rapidly?—No, that is it. You might say, how is this to be done in the spinning room?—Can you attach a tube over your spinning frames like you do to the preparing? I know it is done in one mill, but I doubt if it was done on the best method possible. There are great difficulties. Spinning rooms are more congested than other rooms.

3965. (*Chairman.*) Bear in mind that these days such as you describe are very few in the year?—Indeed, all through the winter there would be two or three of them in the week.

3966. And to put up enormously expensive plant to meet those rather exceptional conditions on very few days in the year would be a very serious thing to ask?—I think it would be unfair until a proved system was agreed upon.

3967. The evidence would have to be very strong before we did that?—I do not think it would be fair to ask the trade generally to adopt any scheme until it had been proved in a particular mill that it was successful. I admit that the expenses would be so considerable and the possibilities of it not being successful would be so great that it would be unfair to ask the trade generally to incur the very serious expenditure, which I do not believe any firm would object to do, provided they knew that there was a system, and that all they had to do was to go and copy it and they would get satisfactory conditions. That is why I used the words "proved system" I believe most mills would object to spending 1,000*l.* in experimenting on a room with the probability of not arriving at the best results; but if experiments were made, and if you could say, now there is a system which is working perfectly satisfactorily, and if you were able to convince the trade that it was a satisfactory system, I do not think the trade would object to carry it out. Certainly, I think it would be short-sighted of the trade not to agree willingly, because I think it is so desirable in the interests of the trade that conditions in the spinning room should be improved.

The witness withdrew.

TENTH DAY.

Wednesday, 26th November 1913.

At Glasgow.

PRESENT :

COMMANDER SIR HAMILTON FREER-SMITH, R.N., C.S.I. (*Chairman*).

Mr. HENRY CUMMINGS.
Mr. HERBERT EWART.
Professor LORRAIN SMITH, F.R.S.
Mr. D. R. WILSON (*Secretary*).

Mr. J—— H—— called in and examined.

3968. (*Chairman.*) What are you, Mr. ——?—Spinning foreman.

3969. For whom do you work?—Crawford Brothers.

3970. And how long have you occupied your present position?—Twenty years.

3971. And what were you before that?—I was assistant. I have been in the mill from a boy.

3972. An assistant weaver?—No, assistant foreman.

3973. Have you ever worked as a weaver?—No, sir.

3974. What class of goods are manufactured at Messrs. Crawford Brothers?—Gilling twine for making nets; 22 cord up to 10 cord.

3975. What counts do you spin?—Numbers—we spin from 4's up to 40's

3976. (*Mr. Ewart*) That is ordinary four lea?—These are the leas.

3977. You are not talking of four pounds? Is it 4 into 200 or 4 into 48?—You see there is three hundred yards to the lea. When I say four leas it is four times 300 yards to the pound.

3978. That is pretty coarse?—Yes.

3979. Is that spun on a spinning frame or a gill frame?—On a spinning frame.

3980. It is not on a gill spinner?—No, it is not a gill spinner. A spinner's frame is entirely spinning, nothing else. We get the rove from the preparing.

3981. Is it all wet?—It is all wet in my department, but there is dry in another department.

3982. Forty is your finest?—Forty is the finest we do.

3983. (*Chairman.*) What pitch are your frames?—We have them from 2½ to 3½.

3984. Have you what are known as splash guards?—You mean the splash boards for to keep the water from going on to their feet in the pass.

3985. Yes. Are they on all the frames?—Yes.

3986. How long have they been on?—Well, they have been on nearly thirty years to my knowledge, but they have been improved since that. They used to be standing on the floor only, but now we have them connected to the frames, and they stay in close and keep the passes drier than they used to do because they were liable to be shifted before and the water got down on the pass.

3987. Do you consider that the floors are kept drier by their use?—Yes, there is some of the women while working with carpet shoes on. Some of them may have sore feet, or something like that, and they bring a pair of shoes and put them on. They have always stockings on.

3988. Do you consider that the room is made more comfortable for the workers by the use of the splash boards?—Yes, a long way than what used to be. These last years there has been a great improvement.

3989. That is since when?—Since the fans went in.

3990. But I am talking now of the splash boards or guards. Do you think they make the room any more comfortable for the worker?—Yes.

3991. In what way?—Well, the girls used to have to keep their bare feet because of the wetness of the pass, and now that is entirely abolished.

3992. Now they work in foot gear?—Yes.

3993. What do they wear?—Well, some wear their boots and some bring in slippers.

3994. And can they keep their boots and slippers dry?—Yes, unless at the time of cleaning. Every three weeks they clean the frames and they take their boots and stockings off then, but that is only once in three weeks

3995. Have you had any experience of working in places where these guards are not provided?—No, I was five years in a Johnstone mill, and they had them too. That was 20 years ago.

3996. Now is there much piecing done?—Yes, they have to piece every time they start a frame; they have to piece the ends. Did you mean as they are working? Well, they do not need to piece much.

3997. I mean while the work is going on?—There is very little piecing then.

3998. What about breakages?—There are not many breakages. It is even better now since we had a lot of new machinery; much better than it was with the old machinery.

3999. Do they do any laying on?—Well, every time a full bobbin is taken off and a new one put on they have to lay on then, and the whole of the frame runs slowly.

4000. (*Mr. Ewart.*) You are leading up to the question, I suppose, about laying on when the end breaks.

4001. (*Chairman.*) When an end breaks, that is what I mean.

4002. (*Mr. Ewart.*) He is dealing with the ordinary course of starting a frame after the fresh bobbins have been put on. Then in every case the thread is laid on to the bobbin. When an end breaks we just splice them.

4003. (*Chairman.*) When an end breaks, how is it joined?—It runs round the roller whenever it breaks and they just stop the flyer with their hand and take the end and draw it up over the thread plate and just lay on the end.

4004. That is piecing?—Yes.

4005. Then is there any what is known as laying on done?—Did you understand the expression "laying on"?—Yes. We could not do any laying on but on to the bobbin.

4006. When a thread breaks do your spinners ever lay it on instead of piecing it?—No. When we start a frame we have to get the rove right through the hot water and to begin the frame they have to make the thing with a twist themselves.

4007. That is laying on?—That is laying on, too.

4008. What I want to know is, when the frame is running and the yarn breaks do you piece it or do you lay it on?—Oh, it is pieced. They have to give it a twist.

4009. Do you do any laying on at all while the frame is running?—No, unless a bobbin for instance was bad and would not work, and they have to take that bobbin off and put another one on and then they have to lay it anew.

4010. (*Mr. Ewart.*) That is the same as if you were starting up a frame?—Yes. That does not happen very often.

4011. I gather that from your experience you are in favour of having splash boards in spinning rooms?—Oh, yes.

4012. And do you think the workers are of that opinion, or would they rather be without them?—They could not work without them.

4013. (*Chairman.*) Now going to another subject, have you any arrangements for the clothing of the workers in your works?—I mean to say, when the spinners come to work I suppose they have shawls and something to cover them, and so on?—Yes, they have some boxes, and others have "bakeys" that is made from wood with two handles. It is a wooden box and it is narrow at the bottom and wide at the top.

4014. You fold the things up and put them in it, do you?—Yes.

4015. Is it a kind of square box?—It is not square. It is about nearly double at the top what it is at the bottom.

4016. (*Chairman.*) Why is it made in that particular way?—At one time they carried the bobbins in them—iron boxes for the bobbins and we got the joiner to make them the same way because they preferred the wooden ones for their clothes.

4017. There is no reason why they should be that particular shape?—No.

4018. Except that they were so and they have always stuck to them?—No, some have just square boxes with a top.

4019. Then the workers put their outer clothing in these things?—Yes.

4020. And it is ready for them when they go away?—Yes; and there is the window. The window is boxed in and they put them on the window.

4021. On the window sill?—Yes, just so.

4022. Are these boxes all on the window sills or any other part of the shed?—They are in every window.

4023. Do you find you have room enough for all of them?—Yes.

4024. What protection do your workers have to keep the wet from getting to their clothing while they are at work?—There is no water goes off the flyer. The splash board catches all the water that comes off. They are made high enough to do that. At that time they were not so high and it came over the top, but it is not now.

4025. So they have no particular protection to keep their clothing dry?—Their clothes are always dry. They will not be wet.

4026. The splash guards keep the wet off them?—Yes.

4027. (*Mr. Ewart.*) Do you know what drip on the roller is—a drop of water on the roller to keep it clean. Do you use that here?—No, it is mostly done where there is very fine yarn to keep the roller damp.

4028. But yours is not fine enough for it?—Not fine enough.

4029. You have no water to catch except what comes from the flyers?—Except what comes from the flyers.

4030. Does the rove run through cold water or hot water?—Oh, hot water.

4031. How hot is it, do you know?—It has to be near boiling point. There is one thing. There is a great danger in the trough lids being uncovered. We suffered very much from this.

4032. (*Chairman.*) Just tell us something about that?—The trough lids covering the trough with the hot water in used to be very open at the back to let the rove down into the water. They used to be from one inch to two inches. We have that abolished now on these new frames that has come into the place. They have got the same but not so wide. They put a tube down there and when the tube comes into the water it keeps the steam from coming up. It used to be that we could not see the water for steam before that.

4033. In fact you think that any method for confining the steam in the trough is an advantage?—Oh, yes.

4034. (*Mr. Ewart.*) I suppose you have some hot weather in Scotland?—Yes.

4035. Do you take any notice of the thermometers?—Yes.

4036. Is it part of your duty?—It is my duty.

4037. Well, did you notice them this morning?—I was not in this morning.

4038. Yesterday?—Yesterday, yes. It was 70°, 63°. 70 in the dry bulb and 63 in the wet.

4039. (*Chairman.*) That is a difference of seven degrees, and were you spinning satisfactorily?—Oh, yes.

4040. (*Mr. Ewart.*) What is the highest you ever knew the dry bulb in hot weather?—The highest would be 83° or 84°.

4041. And what would the wet be then?—It would be seven and eight, sometimes nine degrees of difference.

4042. (*Professor Lorrain Smith.*) Is that about what you work at?—Yes.

4043. Seven and eight degrees of difference?—Yes.

4044. (*Mr. Ewart.*) You have fans taking the steam and hot air out of the room? Have not you fans in the window?—Yes, we can open the windows and regulate the place on a very warm day.

4045. Have you not got fan ventilation?—Yes, two fans.

4046. Are they on one side of the room?—One on each side of the room opposite to the door.

4047. Then how do you get fresh air into the room?—The windows are all open.

4048. Who takes charge of the opening of the windows?—I take charge of them.

4049. Are you allowed to open them?—The girls will not work with them any other way. They are always open unless it is a very cold day.

The witness withdrew.

Miss M—— S—— called in and examined.

4050. (*Chairman.*) What are you by trade?—Spinner.

4051. You work for Crawford Brothers?—Yes.

4052. (*Mr. Ewart.*) Are you in the Barr Mill?—Yes.

4053. How long have you worked there?—Nine years nearly since I went first, but I was left and away for a while and back again.

4054. What was the interval between the time you left and came back?—I was away just about eight months.

4055. With the exception of those eight months you have worked there all the time?—Yes.

4056. As a spinner?—Yes.

4057. Did you work anywhere else before?—I presume not. No.

4058. All the time you have been there you have had what are known as splash guards or splash boards?—Yes, they have splash boards where I have been.

4059. They have been on all the time?—Yes.

4060. Now if somebody asked you, would you like to have them taken off?—No, we could not do very well without them.

4061. Of course you know some people say they are very much in the way of the work?—They are not in our way.

4062. You say you would not very well do without them. Will you tell us why?—We would get wet.

4063. Your clothing would get wet?—Yes.

4064. What about the floor?—The floor and my feet would be wet too.

4065. When you are at work what do you wear on your feet—I mean to say, what kind of shoes or boots?—We just keep an old pair for working inside and shift them when we go home.

4066. You wear the boots that you come to the mill in?—We take them off and put on an old pair to work inside in.

4067. You put an old pair on to work inside?—Yes.

4068. Then you have another pair on to go home in?—Yes.

4069. Do your feet get very wet?—No.

4070. Can you work with dry feet, do you say?—Yes.

4071. I suppose when you come to the mill you have something above the clothes you work in?—Yes.

4072. Some shawl or something?—Yes, a shawl.

4073. What do you put on to protect yourself when you leave your home to go to the mill?—We just put on a shawl.

4074. Only a shawl?—Yes.

4075. Just put it over your head?—No, we do not wear them over our head.

4076. Do you have any particular protection on your head?—No, we only put it on our head when it is raining.

4077. Otherwise you just go to the mill with your bare head?—Yes.

4078. Then the only clothing you have to get rid of while you are at work is this shawl?—We take off our skirts and put on an old one, change ourselves.

4079. Then when you leave the mill you have a dry skirt and a shawl and a dry pair of boots to go home in?—Yes.

4080. Where do you put your clothing in the mill?—We have a box for putting them in.

4081. Where do you do the changing—in the spinning room?—Just in our own passes.

4082. Are men and girls both employed in the same room?—I beg your pardon?

4083. In the spinning room I suppose there are both men and girls employed?—Yes.

4084. You do not find it necessary to have any overall clothing or anything of that sort to keep you dry?—No, we wear pack sheet aprons inside.

4085. Do you find that catches a good deal of the moisture?—Yes.

4086. And keeps your clothing cleaner?—Yes.

4087. Does that get very wet?—No, they are not much wet at all.

4088. When you are at work are there many breakages? I mean while the frame is running. I do not mean when you are starting, but when it is running do many of the threads break?—If it is fine work, they most break than in the coarse stuff.

4089. Can you tell us about how many breakages you would have perhaps in five minutes?—Sometimes we run five minutes without breaking at all.

4090. And sometimes perhaps you would have two or three in five minutes?—Yes.

4091. And, of course, the more breakages the more work?—Yes.

4092. How do you join the pieces together?—We take the one with this hand and just put them together this way (*indicating*).

4093. You do not do any what is known as laying on?—Yes, laying on ends. That is when there is a doff comes off, the full bobbins, and we put on the empty ones you have to lay the ends.

4094. Then you lay on?—Yes.

4095. Then the machine is standing?—Yes, it is going slowly.

4096. (*Mr. Ewart.*) To come back to the question of splash boards. Is not that what you call them?—Yes, we call them fore boards.

4097. I suppose when you are at the frames you have your sleeves rolled up?—Yes, we work with bare arms.

4098. Have you ever found that the top of the board rubs you here under the forearm?—No.

4099. Who does the doffing in your place?—There are little doffers and a doffing mistress.

4100. Did you ever hear any of them complain about the boards hurting their arms?—No.

4101. In your place are the boards moveable?—Yes, you can take them off if you like, but we always keep them on to keep ourselves dry.

4102. But I mean to say for doffing?—No.

4103. You are standing like that (*indicating*)?—Yes.

4104. Or rather facing you they are standing like that, sloping towards you?—Yes.

4105. Do they drop like that for the doffing?—No.

4106. (*Mr. Cummins.*) With regard to these boxes that you have for your clothes, has each spinner a box of her own?—Yes, some of the boxes two people put their clothes in; some has one to themselves. You can keep it to yourself if you like.

4107. (*Mr. Ewart.*) You have each one, have you, if you want it?—Yes.

The witness withdrew.

Miss R—— M—— called in and examined.

4108. (*Chairman.*) I think your name is R—— M——?—Yes.

4109. What are you by trade?—A spinner.

4110. How long have you been a spinner?—Seven years—not seven years a spinner; I was at the doffing before that.

4111. You were a doffer first?—Yes.

4112. And then you became a spinner?—Yes.

4113. Have you worked in the same mill all the time?—Yes.

4114. That is the Barr Mill?—Yes, the Barr Mill.

4115. Belonging to Crawford Brothers?—Yes.

4116. And you never worked anywhere else?—No, I never worked anywhere else.

4117–8. We have heard that in the place where you work you have some splash guards or splash boards?—Yes.

4119. For keeping the water from the workers?—Yes.

4120. We have been told by some spinners that they are very much in the way of work?—I do not see how we could do without them.

4121. Now would you like the law to say they shall be taken away?—No, I would not like that.

4122. You would not?—No.

4123. Tell us why not?—Because they keep the water from coming out. The water would all come out if we had not these foreboards, and we would get all wet.

4124. And do not you get wet now?—No, the splash boards keeps us dry.

4125. Are the floors dry?—Yes.

4126. Do you think the work would be easier if they took them off?—I do not think it would make much difference if they took them off.

4127. You do not think it would make much difference?—No.

4128. Do you find them in the way when you are piecing the ends?—No, we do not find them in the way. We have always been used to them, and I do not think they are in the way when we are piecing the ends.

4129. You think, as a matter of fact, they are an advantage to you?—Yes.

4130. That they keep your clothing dry?—Yes.

4131. And they keep the floor dry?—Yes.

4132. Does much steam escape from the troughs where you work?—Well, they are not so bad now as they used to be. We have now trough lids in the frames. About four or five years since we got them in. There used to be holes for the steam to come through, and now they are just made plain and close in to the troughs.

4133. And has that improved things? Do you feel more comfortable in the spinning room since you had that?—Yes, they feel a lot more comfortable. There is not near so much steam in it now.

4134. In the winter is your room warm enough to be comfortable?—Yes, it is just nice in the winter.

4135. Are the windows open?—Yes, we are allowed to open the windows whenever we like.

4136. As a rule do you keep them open?—Yes, I have nearly always mine open.

4137. Are there any fans?—There are two fans.

4138. Do they run summer and winter?—Yes, they run both summer and winter

4139. In the very hot weather I suppose you feel it rather oppressive at times?—Yes, in the hot weather in the summer time. It is sometimes hot.

4140. I suppose you would not know anything about the thermometers. you do not watch the thermometers?—No, I do not know anything about them

4141. And naturally enough in the very hot weather you feel it a little bit oppressive and are tired after your work?—Yes, that is true

4142. Are there the same means of ventilation in summer and in winter?—Yes, just the same.

4143. The fans run the same in summer as in winter?—Yes.

4144. And what about the windows? I suppose in the summer you would have many more windows open?—Yes, they are nearly all open in the summer, but sometimes there is just some of them open in the winter, because some of us have fine ends and the frost nips them.

4145 In the summer and in the winter some of the windows are open, and in the summer you would have them all open?—Yes, they are all open.

4146 When you go to work in the morning, I suppose you have your working clothes on?—No, we just change our skirts and our aprons in the mill.

4147. And you have, I suppose, a shawl just to protect you?—Yes, just a shawl to go to work with.

4148. Anything else but the shawl?—No, just the shawl

4149. Do you wear the same boots going to the mill as you do in the mill?—Some of them do, but I do not. I shift my shoes when we turn out.

4150. And you have a box?—Yes, for keeping our clothes in.

4151. Do you find you can change your clothing quite comfortably there?—Yes.

4152. Do you do it in the spinning rooms?—Yes, we do it in the spinning rooms.

4153. (*Mr. Ewart.*) Did you ever find the top of the splash board chafes your arms when you are reaching over?—I cannot say that. No, they are not very high, the splash boards.

4154. You can reach over them easily?—Yes.

4155 When you are standing over them you have not to dip down much?—No, we have not.

4156. (*Chairman.*) Are you a piece worker or a day-worker?—Just a day-worker.

4157. What wages are you getting?—Ten shillings per week.

4158. (*Mr. Ewart.*) When you were a doffer did you ever find the boards in your way?—Well, there has been new frames put up since I was at the doffing. I think some of the foreboards were high for some of the wee doffers, but for the big ones I do not think they feel much difference with the foreboards.

4159. (*Mr. Cummins.*) How about your chest? Does your chest never get wet?—No, it never gets wet.

4160 There is no spray comes over?—No.

4161. (*Professor Lorrain Smith.*) Do you wear slippers at your work?—I beg your pardon?

4162. What sort of shoes do you wear at your work?—I wear coarse shoes at my work.

4163. You can wear carpet slippers?—Yes.

4164. They never get wet?—No. One of them is wet, but just at the side. I do not go near that. It is at the side of the pass, and it never runs into the middle where I am working. There is no wet; it is just a dampness at the side.

4165. It never goes where you work?—No.

The witness withdrew.

Mr W—— H—— called in and examined.

4166 (*Chairman.*) What are you, Mr H——?—Do you want my full address? Just my name?

4167. Your name and your occupation?—W—— H——, spinning master to Knox's, Limited.

4168. And the name of the mill?—Dennyholme Mill, Kilbirnie, North Ayrshire.

4169. How long have you been a spinning master?—I have been in the same place—120 feet long by 42 feet broad, and I have about upwards of 5,000 spindles in it

4170. Tell me how long you have been there?—57 years.

4171. And I suppose you have seen a good many changes in the mill during the 57 years?—Oh, yes, hundreds of people. I have over 50 workers, and a generation went to the grave.

4172. Yes, well, we will not trouble them?—No.

4173. What class of goods do you spin now?—All wet spinning. I have been among wet spinning all my days, that is flax spinning. The great amount of my work, Mr. Chairman and gentlemen, is done for the shoeing machines In my first days it was all for tailors ——

4174. We will not go back to the early days, because we have to settle things for these days. Well, the whole that I do at the present time, I spin from 12's up to 250's.

4175. Yes, that is what we want to get at now?—Yes.

4176. Have you what are known as splash guards or splash boards?—Yes, in that whole period of time there has never been nothing else but these foreboards.

4177. You say you have worked there for 57 years?—Yes.

4178 Have these guards been on all that time?—All that time. I have just got six new ones in now.

4179. Will you tell us what advantage you consider them to be?—I consider they are the best as ever I seen in my existence simply from the fact that they keep the rooms splendid. I have had scores of different machine men from all parts of England and Ireland putting up machinery for me and they informed me that they never saw nothing near to equal it for cleanliness. You do not get any water nor muck on the floor The girls are all dry I have seen them in a mill or factory or two with oil aprons on and they are a complete failure, in my opinion, because the women's limbs get damp and wet and their bodies here gets wet. I would not say wet, but damp.

4180. From perspiration?—It is a very difficult matter, gentlemen, in a wet spinning place to keep water in its own place.

4181. You think that these splash guards protect the workers?—Yes, sir.

4182. Is there another side to the question? Do the workers have harder work in consequence of having them on or is it more difficult for them to work?—I do not understand you, sir.

4183. I suppose there is some piecing to be done?—Yes, constant.

4184. Are the splash guards in the way of the piecing?—No, oh no.

4185. They are not?—No, and even when they clean the machines they are just removed back. They are 18 feet long and you just remove them back and you have the machine before you. If you would allow me to make a remark here, if I was the Prime Minister of Great Britain I would make it imperative on every manufacturer in flax spinning—I am not speaking about cotton, I am speaking about flax spinning—I would make it imperative that these should be put there.

4186. When the ends break do they do what is known as laying on?—When they break they take the left hand and stop the spindle and they take with the right hand the thread and twist it with the left and under it goes.

4187. (*Mr. Ewart.*) Just under the roller?—Yes.

4188. (*Chairman.*) They do not do what is called laying on?—No.

4189. You spin up to very fine counts?—Very fine, 250's, but there is very little of it done.

4190. (*Mr. Ewart.*) Just to settle this point. Most of your yarn goes on to the twisting?—Yes, when it leaves me, gentlemen, there is a girl or a woman clears it in tins. Perhaps there will be 30, 40 or 50 pounds in a tin. With the heavy cans of course I allow her to get a boy or a girl to help her with these heavy ones, but all the light ones she carries herself.

4191. What I was alluding to was this. Where yarn goes to the twisting it is not wise to lay on. They want to have the yarn continuous for the twisting?—Yes.

4192 (*Chairman.*) Will you tell us please, the pitch of your frames?—From two inches to two and three-quarters.

4193. How do you ventilate your spinning room?—I work it always with my windows. The inspector has wanted to get in fans to me once or twice—a very sharp man. He is gone now. I have never got them. The last time I saw him he says "*You have not got any "fans yet, I see.*" "*No, sir, I work it all with my "windows.*" My windows go up, and I pay very particular attention to them. I work them all myself mostly, because I do not like heat, gentlemen, nor my women do not like heat.

4194. You watch the thermometers, I suppose?—Yes, I take charge of them myself and mark the records twice a day between eleven and twelve and three and four with pen and ink, and send them all at the end of the month to the counting house and to the office and I believe they will be sent on to London.

4195 In the very hot weather what is the highest temperature that you get, say, in a hot summer?—Well, the summers vary sometimes. I had a very hot summer recently and even last summer there were several days that it was 85°, 86°, 87° and 88°, and that was with every conceivable door, window and hole where I could let in the air.

4196. Was that dry bulb or wet bulb?—The dry bulb.

4197. What was the highest wet bulb that you got?—That may be about eight of difference. That might be 80° and the other was 87° or 88° or 86°.

4198. Will you tell us please what difference between the thermometers do you want for good work in the spinning room?—Well, I like 70°. It is a very difficult matter to keep it at one point, gentlemen, because the weather takes a lot of vagaries.

4199. Tell us what you would like?—70°.

4200. 70° wet bulb?—No, 70° heat bulb.

4201. 70° dry bulb?—Dry one.

4202. What difference between the two?—Well, they vary greatly. They vary very much.

4203. What do you consider desirable for efficient work?—About four or five.

4204. Four or five degrees of difference?—Four and five, but, mister, I have seen it ten and twelve.

4205. And were you spinning all right?—Yes, it is all right so far, but the heat becomes so oppressive, do you see, that I think extreme cold and extreme heat do not do with my work. I think 70° is a heat that the nature of the work demands and the women like it. I have seen the women strip and go about with their bare breasts when times are very oppressive.

4206. (*Mr. Cummins.*) What arrangements have you for the clothing of the girls?—I have no arrangement like. They just do their own. They generally shift their clothes in the place and put on old clothes not so good as those they wear to go out.

4207. But what arrangement have you for putting away their clothing when they came into the works?—They have a box. I get the joiner to make boxes. A box like that (*indicating*). Sometimes there will be two girls put their clothes in the one box. I might say the inspector found fault with me when he came in because of the great difference between the bulbs, the wet one and the dry one. He came in and catched it once with a difference of 10 and 12, and he told me that he found fault with me. "*Well, Mr. ——,*" I says, "*You did not want me to put down fictitious figures, at all, did you?*" "*Not at all,*" says he, "*but I want you to go and report to the manager.*" I did that what he told me. When I gaze at it with my specs. on I says, "*Here's the dry one 80° and this one 70°.*" Says I, "*Come here until I show you the thermometer,*" and when the manager came he could do no more than I did. He turned round to me and he says, "*It's the peculiarities of the day, the vagaries of the day—so dry.*"

4208. (*Professor Lorrain Smith.*) Why did he find fault with you for that?—I will tell you the reason. I think Mr. ——— liked it about three or four or five of difference between the two.

4209. (*Chairman.*) Why did he want it three, four or five?—Because he was under the impression that there was something wrong, and he carried a thermometer in his pocket, a very peculiar one. He just took it out and hung it up to see if the thermometers were working right.

4210. He thought perhaps your thermometers were not working very well?—Yes.

4211. That does not help us very much?—And he paid particular attention - -

4212. We do not want to hear about all this. It has nothing to do with us.

4213. (*Mr. Cummins.*) About the clothing. You say two girls used one box?—Yes, I have seen three, and sometimes one.

4214. (*Chairman.*) Why do not you give them a box apiece?—Well, your idea is a right one, Mister, but I could tell you the reason why.

4215. Well, tell us the reason?—I have had a great difficulty in my life sometimes. Many a time I have had to interfere. You know there are dirty people in this world.

4216. Yes?—And sometimes a girl would come in and there might be like wee beasties on her you understand, and a spinner would not put in her clothes beside her.

4217. We know all that. What I want to find out is, why knowing that, do not you have one box for each person?—Well, if I was going in and saying that they would think I was an extravagant man.

4218. I thought money was no object in Scotland?—You know since these limited companies have been formed there is awful changes taken place. If I want a lead pencil, and I get through a good many, I have to sign——

4219. Yes, never mind.

The witness withdrew.

Mr. J—— F—— called in and examined.

4220. (*Chairman.*) What is your occupation?—Spinning master.

4221. In what works?—Knox, Limited.

4222. And the name of the mill?—I have been 27 years a spinning master and 10 years previous to that I was in a spinning and twisting room combined. That is 37 years.

4223. In what capacity before that?—As foreman.

4224. Spinning master?—Yes, foreman in twisting and spinning. That is the same.

4225. Have you ever worked as a spinner?—No; oh, no.

4226. You have always been overlooking; you have not worked as a spinner yourself, ever?—No. I can do it.

4227. I have no doubt you could do it. How long have you been in your present occupation?—27 years in that occupation and 10 years in the previous one.

4228. And all the time in the same mill?—The same firm.

4229. And the same mill?—Well, there is the East and the West Mill and the Dennyholme Mill, do you see. The first time I was in the West Mill.

4230. And at present you are in the East Mill?—East Mill.

4231. How long have you been in the East Mill?—27 years.

4232. What counts do you spin?—Well, in my department it is what they call the coarse spinning department, and we spin some heavy tows, says 8's to 14's and flax we spin anything from 8's to 70's. I have seen as fine as 70.

4233. Have you any experience of finer counts than 70's?—No.

4234. Then your experience is limited up to 70's?—Yes.

4235. What is the pitch of the frames?—Well, from 2¾ to 3½ inch.

4236. Then you are required by law to have splash-guards on for these frames, I think?—I could not say for the law, but we have splash-guards on. We call them splash-boards.

4237 Have you ever worked without them?—Never.

4238. They have been on ever since you have known the spinning rooms?—Since ever I went to work, about 40 years ago.

4239. What is your opinion about them? Would you have them off, or supposing it was suggested they should be taken off, what would you say?—I would not have them off at all. It would be a dirty business with them off.

4240. Tell us what good they are?—Well, they keep the worker dry and they keep the place clean.

4241. Do you consider that they interfere with the worker at all?—No.

4242. The ends are joined by piecing, I suppose?—Generally. This is work where we do not piece ends. There is certain kinds of work we take off the bobbins and put them on anew.

4243. You do not do any laying on while the machinery is running?—Oh, yes, that is what you do. You do not piece ends. You have to take off the bobbins and put on empty ones and lay it up.

4244. Do you find when the workers are doing that the splash-guards interfere with them?—Not in the least.

4245. I intended to ask the last witness a question about that. He spoke as if something could be removed.

4246. (*Mr. Ewart.*) Yes, I would like to know that. He conveyed to us that they stood on the floor?—They do in some cases; they are not all on legs. There are brackets screwed on to the step and there are slots for putting the wood into. It is best to have them that way, but we have them to our own design, and they are all in one length with a run on the bottom.

4247. Just tell us exactly how your guards are made?—Our own?

4248. Yes?—The piece of wood is the full length of the frame and there is a run nailed on to the bottom, and it sets at a little bit of an angle with a 1½-inch iron like that, and that comes down here again; the boards are nailed on to those and it is connected with a leg with this other piece of iron, and you can lift the whole thing back at once, if you want to oil the frame like. That is all the difference.

4249. You lift the whole thing back into the centre of the alley?—Yes, exactly; the oiler takes the one end and the girl, the spinner, takes the other end, and they lift it back. In the other case the girl has to lift each one.

4250. Supposing the frame is there, the guard would be something at that angle (*indicating*)?—Yes.

4251. Is it fixed, or does it move backwards and forwards?—It is a fixture.

4252. About the clothing of your workers. What arrangements have you for putting away the clothing, the shawl and the skirt, that they come to work in?—In my department we have empty soap barrels. They are cleaned, and they have one in each pass. They fold their shawl or their skirt and put it into that barrel.

4253. Is there one for each person?—No, because one can hold two.

4254. Do they object to that at all?—No, they rather like them.

4255. They like having one for two?—Yes.

4256. I suppose they arrange between themselves what two shall share?—Well, it is left to themselves. There is never any bother.

4257. In taking evidence it has been suggested to us that some of the workers would not like to have their clothing with another worker because that worker might not be very cleanly?—That is true; that has happened—very seldom—but it has. In fact, in a case we have been compelled to put a girl out to clean herself, and then we have given her a special tin made of black iron to put her own clothes into, but it is one solitary case in my experience.

4258. You watch the thermometers, of course?—Yes.

4259. In the hot weather can you recall what is the highest wet bulb thermometer that you had in hot summers?—The highest ever I registered since the thermometers started was 91° and about 82°.

4260. Is that wet bulb?—Wet.

4261. 82° wet?—Yes. That is the very highest, 91°.

4262. In the very hot weather—take an average summer—what would be about the average of the wet bulb thermometer? Take the hot days?—That is really a thing I have not paid any special attention to, I might say; but in dry, warm weather there is always a good difference of five and six degrees

4263. The average distance between the wet and dry bulb thermometer you would say is what?—About six to seven for an average, perhaps. That is only saying that, I would not like to swear to the like of that, because I am not taking any notice particularly.

4264 But that is approximately right, you think?—Yes.

4265. With that difference does the work go on satisfactorily?—Oh, yes, in connection with any work that I would be doing.

4266. How do you ventilate your spinning rooms?—Well, with our windows. They open both top and bottom and we have two fans

4267. Do you keep them running both summer and winter?—Oh, yes.

4268. Then the ventilating is approximately the same on a very hot day as on a very cold day. Is that so?—No, we shut our windows on a very cold day.

4269. On a cold day you shut the windows?—Yes. Yesterday morning they were nearly all open

4270. You depend on the fans to bring fresh air in?—Yes

4271. (*Mr. Ewart.*) Do the fans bring fresh air in?——

4272. (*Chairman.*) Are they plenum or exhaust fans?—Well, I could not tell you the term.

4273. Do they bring the air in or take it out?—No, they take it out.

4274. They are exhaust fans?—Yes.

4275. The fresh air gets in through cracks and crannies?—The lower part of my windows are all up generally about an inch. I keep them up to let out the water that condenses when the mill is stopped. Instead of running on down the wall it runs out of the window.

4276. You have two fans exhausting, and the fresh air would come in through these slight openings in the windows. Is that so?—Through the windows. They are ordinary windows.

4277. But they are not all open?—Yes.

4278. In winter?—Yes, we open them an inch or two.

4279. But I understood you to say just now that in winter you shut the windows?—They are not shut continually—no.

4280. You open them occasionally?—We open them if we need to open them. In fact we would always open our windows.

4281. In winter?—Yes.

4282. Is it not too cold?—No.

4283. Now, supposing that you had the whole of the windows closed. First of all, do you ever have them all closed?—Never, except a little in the morning. I do not open the windows in the morning till seven or eight o'clock.

4284. Then the fans are taking the air out. I understood you to say just now there was a little opening at the bottom of the windows?—Yes.

4285. Then the fresh air would come in through that. Is that what you mean?—Yes. I have a roller, like, below each window, and it does not lift it up scarcely any; and there is the door.

4286. (*Professor Lorrain Smith.*) Do you say the splash-boards have been in during the whole 40 years you have been working?—Yes.

4287. When were they introduced?—I could not tell you.

4288. You have never heard that?—No.

The witness withdrew.

Mr. J—— D—— called in and examined.

4289. (*Chairman.*) What position do you occupy?—In charge of the spinning and twisting department—wet spinning, hot water spinning.

4290. How long have you worked for this firm?—About 34 years.

4291. In the same mill?—Yes, in the same department.

4292. And before that where did you work?—Well, I worked in a place they called Guilford, in the county of Down—MacMaster and Company.

4293. Since then you have worked in this country?—Yes.

4294. What counts do you spin here?—We spin 35's to 120's.

4295. Can you tell us the pitch of the frames?—Yes; 2½-inch.

4296. All 2½?—All the spinning is 2½.

4297. You know what I mean by splash-guards. You have different names for them?—Splash-boards, yes.

4298. How long have they been on?—They have been on all my time—before I came here.

4299. What is your opinion—do they keep the floors and the workers dry?—Yes, I have a very high opinion of them. I do not know how we could get on without them, in fact.

4300. Will you tell us what they do? Tell us what you think the good of them is?—Well, they keep the water off the women. The water is splashing off the flyers, and instead of coming up against the girls it splashes up against the board: and there is a run right along, and of course the thing is set to run the water into the drain at the end.

4301. Supposing someone suggested that these things should be taken off, and that instead of that the workers should wear some sort of protection: do you think the workers would like it?—I do not think they would like it. It would cause a great disturbance about the place. That is my opinion.

4302. You think they would prefer to have them on?—Quite so. It is no inconvenience to the girls at all; they are brought up to it.

4303. When the machinery is running, of course, there is a considerable number of breakages?—Yes, quite so.

4304. Do you do piecing?—Piecing, yes.

4305. And do you do any laying on?—Yes.

4306. At what frames do you do the laying on?—Spinning.

4307. Yes, but I mean any particular counts, or any particular kind of goods?—When we are stripping the frames when the bobbins are full.

4308. But I mean when the yarn breaks when they are running?—That is pieced.

4309. Not laid on?—Certainly not.

4310. When they are piecing do you find that the splash-boards interfere with the work?—Not in the least.

4311. Your girls do not wear any particular protection?—No.

4312. You do not think it necessary?—No, it is not necessary. To give you an idea of the state of the place, they could go about in their stocking soles in hot weather spinning, so there is not much water there, only when we would be washing, once a week or so.

4313. How do you ventilate your spinning rooms?—We have two fans.

4314. And I suppose windows?—Yes, they are all open from the top.

4315. The fans draw the air out, do they?—Yes.

4316. They take it out of the room?—Yes, outside—condensed steam, and that sort of thing.

4317. You have means for keeping the steam in over the troughs, I suppose?—Yes, tubes.

4318. Do you remember anything about the state of things when you worked in Ireland?—I do, quite well.

4319. Had they any splash-guards on?—A few. In some firms, that spin very heavy numbers they had a few, but as a rule there were none in my time.

4320. Do you think there is greater comfort with them on than where they are not on?—Most decidedly; a vast improvement. I have seen the girls in this place I refer to in Ireland wet through before breakfast time. That is a thing you never see here; it could not be here.

4321. Now, as a practical spinner, supposing somebody said to you that these splash-guards would be very much in the way where they had laying on to do, what would you say?—I would say it was nonsense. I do not see why they cannot do it at one place as well as another. We have little girls—little things about this high—and the board is before them, and they can do it all right, without any difficulty.

4322. Then the machinery is running very slowly, I take it?—Slowly, certainly, at the start.

4323. There would be a difference when it is running at its full speed?—We do not do that. When we are putting on a fresh set of bobbins we keep the frame going slow for a little while.

4324. (*Mr. Ewart.*) Is all the yarn you spin twisted?—Yes.

4325. What were you doing in Guilford 34 years ago?—In the same line.

4326. In the spinning room?—Yes.

4327. They laid on there, did they not?—Yes, at the starting when we are putting on the first bobbins.

4328. Did not they spin any yarns there which they laid on if an end came down?—I have never seen that. You see in that case, Mister, the reeler would object to that.

4329. So she does still?—Of course, at odd times some of them for speed would lay on an end, but we do not allow it. Supposing an end drops and the girl wants to get an end on the bobbin to piece it up, and perhaps she experiences some difficulty in finding the end, if she can get the chance to do it she will just lay it on, but it comes back to us as a rule.

4330. (*Mr. Cummins.*) What arrangement have you for the clothes of the workers?—Well, we have boards for the girls' clothes. Each girl has one in her stand or pass, as she calls it. She has a board about that breadth, and her clothes are all rolled up and laid on this board, and everything is quite dry.

4331. Each one separate?—Each one by themselves. May be a little doffer or two little doffers will put their clothes on the one shelf, as it were. It is dry enough. I have never heard any complaints about that.

4332. Are your splash-boards movable?—Yes, we have to lift them off every morning when we are oiling the machinery. They are in sockets. There are three sockets along the bottom rail of the frame, and there are three metal stands or four, according to the length of the machine, of course. and they go right down into these sockets, and this is bolted on the bottom rail of the frams with bolts and nuts, and that is the only time they would be off, except when cleaning the machine we require to take them off The machine is stopped then.

The witness withdrew.

Mr. T—— L—— called in and examined.

4333. (*Chairman*) What position do you occupy?—Spinning master in No. 3.

4334. In No 3 what counts do you spin?—I spin from 4½ lbs. tow up to 40's lea.

4335. That would be all pretty coarse?—Yes

4336. You have nothing finer than that?—Nothing finer than that.

4337. How long have you been in these works?—I have been here about 45 years.

4338. Then you do not remember much before 45 years ago, I take it?—No.

4339. Could you give us any experience of other places?—No, I could not say about other places. I have never been.

4340. You have these splash-boards on?—Yes.

4341. How long have they been on?—They have been on since ever I came there, that is 26 years, since I got charge of that room.

4342. What is the pitch of your frames?—2 to 4½-inch.

4343. Supposing somebody said to you that it was proposed to take away the splash-guards, and in place of that to give the workers some protection in the way of overalls, or something of that sort; what would you say about it?—Oh, well, I prefer the splash-boards.

4344. Will you tell us what you consider to be the advantages of the splash-boards?—Well, the advantage I consider in the splash-board is this, that the girls are kept dry and it is much pleasanter for the girls to work when they are dry. If they had an overall about them they are tied into it, and they have not the same freedom. I had an occasion for to try overalls at one time, but they would not have them at all; the girls had no freedom in them.

4345. When you took off the splash-guards, how did the floors compare with when they are on?—There is a big difference. The floors are wet.

4346. The floors are wet then?—Yes, and I prefer the floors dry. Of course, it is very unpleasant to be working among water the whole day.

4347. How is your spinning room ventilated?—Oh, just by the windows.

4348. Have you any fans?—Yes, I have three fans.

4349. Do you keep them going both summer and winter?—Summer and winter.

4350. Do not you get it rather cold in winter sometimes?—Well, we have got in new windows now, and they fall down from the top and we do not get the draught as before when the opening was in the centre of the window, and when it was opened the cold wind came blowing in.

4351. Where are the fans placed?—They are placed on the west side of the room.

4352. Both on one side?—The whole three are on the one side.

4353. Why are they all three placed on one side?—Well, I do not know what would be the idea of putting them all on one side. I expect it would be for to draw in all the cold air in the summer time off the other side. The sun does not get at the other side of the mill.

4354. Do they send air in?—No, they draw it out.

4355. They take it out?—They take it out, but they draw it in from the other side

4356. You think the three fans ventilate the whole room?—Yes.

4357. Draw air right through the room?—Right through.

4358. What inlets are there for the air? Where does the air come in?—It comes in from the windows on the other side.

4359. Are there any side windows?—Yes, the fans are along that side of the room. This side of the room the windows are open and the air comes in.

4360. What clothing arrangements have you for the workers? I mean to say have you any place for them to put their shawls?—Yes.

4361. I suppose they have another skirt for working in?—Yes, we have a place in the window for that

4362. How is it constructed?—Just a board, and the girls fold their clothes and put them on it. Each girl has a board in her window and she takes off her skirt and puts it on the board.

4363. Just lays it on a board; not a box of any sort?—No.

4364. Does is keep dry?—Yes, perfectly dry. If it was not keeping dry we would hear about it.

4365. Do your girls work in bare feet, or do they work in shoes?—There are many work with bare feet and a good many wear shoes.

4366. Is the floor sufficiently dry?—The floors are kept perfectly dry. Whenever I see the floor wet I make a point to get it dried up.

4367. (*Mr. Ewart.*) Where does the wet come from?—It may be the back gutter of a spinning frame might get choked.

4368. It would only be an accident?—Only an accident, certainly.

4369. Have you any water drip on the roller?—No.

4370 (*Chairman.*) What difference, as a rule, do you have between your thermometers, wet and dry bulb?—Well. I have seen it two degrees, and I have seen it nine in summer time, but I have never seen it below two. When it goes to two I try ways and means to bring it up to three. I never like to go below three.

4371. But from a practical spinning point of view, to get good results, what would you say was the best difference?—I should say four or five. I find when I have four or five degrees difference I have the best results in my spinning.

4372. And about what temperature?—About 68°.

4373. (*Mr. Ewart.*) Is that 68° wet or 68° dry?—68° dry and 64° wet.

4374. (*Chairman.*) That is a very comfortable temperature to work in, I should take it?—Yes, I always try to make a point of that because I find it comfortable for myself, and I like to make the girls as comfortable as I am.

The witness withdrew.

ELEVENTH DAY.

Thursday, 18th December 1913.

At Manchester.

PRESENT:

COMMANDER SIR HAMILTON FREER-SMITH, R.N., C.S.I. (*Chairman*).

Mr. G. HERBERT EWART.
Professor J. E. PETAVEL, F.R.S.
Professor J. LORRAIN SMITH, F.R.S.
Mr. D. R. WILSON (*Secretary*).

Mr. MAURICE SUTCLIFFE called in and examined.

4375. (*Chairman.*) Are you a member of the firm of Sutcliffe Ventilating and Drying Company, Cathedral Gates?—Yes.

4376. I take it you have given a considerable amount of attention to the question of ventilating and humidifying?—Not humidifying. We do not touch the humidifying; we are concerned with the cooling and ventilating of doubling and ring spinning rooms and places of that type.

4377. Have you any knowledge of weaving sheds and spinning rooms in Ireland?—Very little.

4378. Have you ever seen a spinning room in Ireland?—I have been over a few places. That is flax spinning Really I went there for the dust-removing problem.

4379. That would be spinning, I think?—No, it was more the carding.

4380. Roughing, sorting, hackling, carding, and that sort of thing?—Yes.

4381. But you did not go into the spinning room?—No.

4382. Or the weaving shed?—No.

4383 But probably you did go into preparing rooms?—Yes.

4384. You probably know that there was lately an inquiry in regard to humidification and ventilation in cotton mills?—Yes.

4385. And that legislation has followed that report?—Yes; that was from the humidity point of view.

4386. Yes. Now this present Committee is extending its inquiries to flax spinning and weaving?—Yes.

4387. Not all the same members, but some of us sat on the former Committee?—Yes.

4388. I think it would facilitate matters if I explained to you what we are trying to do. I will mention first spinning-rooms. Now as regards spinning rooms, the process is wet spinning, and naturally there is much humidity present; the floors are damp and there is a considerable amount of spray given off from the flyers?—Yes.

4389. The rooms generally have windows on either side, and frequently there is a considerable natural ventilation. I think perhaps you will understand from that the condition of the rooms; at any rate you can probably form a rough idea?—Yes.

4390. Now we have studied the records of temperature, and we have ourselves noted temperatures during the last summer, and we have come to the conclusion that at times the temperature is in excess of what is desirable for health?—Yes.

4391. Now the point that we want to arrive at is this. Remembering that there is always a considerable amount of natural ventilation from windows, what we should like to know is whether you as a practical ventilating engineer could suggest some means for reducing the temperature. That is to say, when the wet bulb temperature gets up to (we will say) 75° we want to reduce the working temperature. We should like to know whether you can suggest any practical means by which the temperature could be reduced?—Well, I have one or two photographs of doubling-rooms and ring-spinning rooms. I do not know whether that is what you want. That is a photograph showing the outside of a building at Mansfield. The doubling room is on the ground floor; it is 150 feet long by 90 feet wide by 14 feet in height, cubic contents, 180,000 cubic feet. In that room I put a certain sized fan which produced an air change of twice an hour, and that gave a temperature drop of 10 degrees.

4392. (*Mr. Ewart.*) That is 360,000 cubic feet of air?—Yes. I blew in just double as much air as there was in the room in an hour's time and that gave them a drop of 10 degrees.

4393. (*Professor Petavel.*) That is as compared with no ventilation at all?—Yes. That was just to give you an idea of the lines we have been working on. Now there is another photograph of a mill near Greenfield. They have three doubling rooms that would rise at times to 105° on the dry bulb. The rooms were 140 feet by 45 feet by 9 feet only in height, and I gave them a change just over six times an hour and they got a drop of fifteen degrees. That is, with the fan stopped, the room might get up to a temperature of about 102° and would drop fifteen degrees by having the fan going, on the same day.

4394. (*Chairman.*) What was the outside temperature?—That would vary, but as a general thing they would get fifteen degrees drop. Supposing 60° outside and 102° in the room, I could give them fifteen degrees drop from the 102°.

4395. What outlet ventilation had you?—In that case it was simply from the windows, and I was blowing air down the centre of the room. To give you an idea of that ——

4396. One moment. Blowing air down the centre of the room—was that by trunk ventilation?—Fan and trunks.

4397. Distributing trunks?—Yes. *This* is the air inlet, *that* is a fan, and *there* is a distributing trunk right down the centre of the room.

4398. (*Mr. Ewart.*) In that room in which you spoke of high temperature, what is the source of heat; is it gas?—No. It is a doubling room. Doubling machines get up a very high temperature by the friction of the machines

4399. Friction only?—Yes, and a number of ring-spinning rooms the same. Those all seem to vary considerably in temperature. I notice that I have two air changes in some cases. That is the smallest I could go to, and 6·5 changes per hour were the most I give. Of course when I say I gave only two changes, that does not quite convey what I wish, because with the ring-spinning room you had ring-spinning for three-quarters of the way down, and then you get a winding room, which does not give off much heat, for the other quarter, but here we have given the total area of the whole room.

4400. (*Chairman.*) The conditions you describe seem to be very different to the conditions that I tried to describe to you, inasmuch as in the one case before you put your fans in there was practically no ventilation, in the other case of the spinning room there is a considerable amount of natural ventilation from the windows?—When I say no ventilation, of course the windows will open, but it does not mean that they will be kept open.

4401. In the case we are dealing with, generally speaking, some at any rate, of the windows, and often all the windows will be open?—Yes.

4402. What we want to do is to reduce the temperature under those conditions. Could you form any idea of how many times the air would have to be changed to produce any material reduction of temperature?—Judging from the general run of the places, I should say about five times an hour.

4403. (*Professor Petavel.*) If you were told that, in an average spinning room in Ireland, the air is changed ten times an hour under present conditions, what changes would you require to produce an appreciable improvement on present conditions?—If they change already 10 times an hour all the way through the room with proper distribution?

4404. Yes?—I should say you are getting so near a draught point that they could not stand much more. That would be my idea of it. Blowing the air in is not necessarily change.

4405. It is extracted?—Of course you get a better cooling effect by blowing air in than you do by extraction. I find it so. It is not often I can extract in the centre of the room and let air come from the outside. To extract from the same side as the in-coming air is not good practice.

4406. (*Professor Lorrain Smith.*) You cannot tell where air is coming in?—No, but if you blow it in you blow it in at the worst point and make it find its way to the outlets. That is why I prefer blowing in to reduce the temperature.

4407. (*Chairman.*) And trunk distribution?—It is trunk distribution right away down the worst part of the room, generally in the centre of the room.

4408. When you say draught, do you think there would be very much draught with so many outlets?—Ten changes per hour would give so much air movement in the room itself that the people would not like to have it on; they would prefer to have it off.

4409. (*Professor Petavel.*) You have no experience of flax spinning mills?—No, not from a cooling point of view at all. We have supplied fans for extraction, but what effect they give I do not know. It is not on the right system so far as we are concerned. The right system we have found is to blow down the centre of the room and blow in under slight pressure. The fans we have been supplying for ventilation have been working at about two inches on the water gauge. That shows one (*exhibiting photograph*). It is at the Dolphin Doubling Company. They screen the air as it comes in to purify it. That shows the start of the duct which goes into the main room.

4410. Have you got any figures showing the relative amount of power required, firstly when the air is blown through a duct down the room, and, secondly, when it is extracted directly from the windows of the room?—The amount of power required in the one case discharging a certain amount of air into the room and in the other discharging it simply to the outside?

4411. In the one case with the duct and in the other case without the duct?—In the case of the one with the duct there will be probably twice as much power required as in the one extracting.

4412. For the same amount of air?—For the same amount of air. In the one case where you have no duct in you can use what we call volume fans, that is an open-bladed type of fan; in the other case we have to use a pressure fan, that is a cased in fan, to force it down a smaller duct. Naturally if you had a 36-inch fan extracting in a window with no duct it would be a simple matter, but to discharge air in with a 36-inch volume fan would mean a 36-inch duct running down the room.

4413. (*Mr. Ewart.*) What size of duct do you use?—We never get much more than 18 inches. If it needs more than that we put two fans.

4414. Do you taper the ducts?—We taper the ducts that are to take air in.

4415. (*Chairman.*) That is to get uniformity throughout?—Yes, and to keep the velocity up.

4416. (*Mr. Ewart.*) Do you work at any standard velocity at the point of outlet?—No. Supposing I go into a room—say, a spinning room—I should note where the windows come and where the outlet would be, or if there is a hoist or door or lift, or anything of that kind, so as not to get too near with my discharge pipe and allow the air to short circuit.

4417. You do not distribute from every bay?—No.

4418. Would you distribute vertically or horizontally?—Horizontally.

4419. (*Chairman.*) With something to prevent direct draught, I take it?—Yes; we place a spreader on the pipe—open it out as we come to the outside, so that it is a kind of nozzle, for the air to spread straight away.

4420. You are careful to see there is not a direct draught upon the worker?—Yes, I keep it horizontal.

4421. (*Professor Petavel.*) You can guarantee, I presume, a given performance in advance with the fan which you propose to put in?—From the amount of air moved, yes; from the amount of power taken, yes; but for the effects in the room, not always. As regards a drop in temperature, not always. Say I have a temperature of 90° in a room, I could not say if I send you so much air into this room it will give you a drop of ten degrees; I could not always say that, because the air sometimes what is known as "pockets" in different parts of the room, where I do not get that drop. The general temperature would be ten degrees lower, but I cannot always get it just where the machinery is giving heat off. It would be very difficult to fix a standard and say for five changes in a room, where there is a temperature of 90°, I am going to drop it ten degrees. I do not think I would be able to accomplish it every time. Nine times out of ten I could, but the tenth time I might not.

4422. So you think any regulation with regard to ventilation should preferably specify the quantity of air and not the drop of temperature?—If you like to specify that they must not exceed a certain temperature, that would be all right. You could say, you must not exceed a certain temperature in this room. You could give them that, and an engineer could work to that.

4423. And you guarantee to do it?—I could guarantee to do it.

4424. You would take a contract on those lines?—On those lines certainly; I could do that.

4425. (*Chairman.*) I will put it to you in this way. Supposing that that temperature, we will say, was 75° wet bulb on a very exceptionally hot day in the summer, when the temperature outside—take an extreme case—was 90°. Do you think you could keep the temperature inside down to 75°?—I do not know about on the wet bulb. When I was talking of these temperatures I was on the dry bulb all the time. I could not say what I could do with the wet bulb, because the humidifying point has not been brought into my work.

4426. Say it was 75° dry bulb and the temperature outside was 90°, could you, under those conditions, keep the temperature inside 75°, do you think?—Not in the way I have been working. I could not get below the outside temperature, because I am simply pumping in the outside temperature to cool the room.

4427. Then it would not do to say under no conditions shall the temperature rise above a certain amount?—Unless the outside temperature is higher than the inside temperature specified. Otherwise it would mean putting in some form of brine pipes to cool the air entering the room.

4428. (*Mr. Ewart.*) Is that done anywhere?—Not for cooling factories that I know of. The only place where it is done is where we are drying material, and they do not want to have any dust. We pump the warmed air into a dryer and pump it back over brine pipes to condense the moisture out of it.

4429. That is for chemical works, &c.?—Chemical works and bottle works, and places like that, even in some cases laundries where it is all white goods they do. I have not known any factory go in for it for cooling. People like Hans Renold, the chain people, wash all the air before it comes in. That has a certain cooling effect, but not much.

4430. How much—two degrees?—Not much more.

4431. Would they wash it with ordinary tap water?—Yes, ordinary tap water of about 50° as a general thing.

4432. Then the air will be going in at 50°?—It might be going in at more. The water keeps fairly constant all the time, and the atmosphere outside might get up to 70° or 80°; but they are really washing it for the purpose of taking the dust out—the Manchester dirt and dust. We tried experiments with steam radiators that would warm the air, say, up to 130°, and with cold water in the radiators the drop in temperature was only two degrees with the water passing through the same surface in each case.

4433. Ordinary water?—Yes.

4434. What was the difference in temperature between the air you were wishing to cool and the water you were using to cool it?—It might be the air 60°, or perhaps even more, say 70° in the warm summer weather, and I wanted to get it to 50°.

4435. And what was the temperature of the water?—50°, whereas the same heating surface with steam in would warm up the temperature to 130°.

4436. That is, a difference of 20° between the air and the water would not reduce the water more than 2°?—No, it would not.

4437. (*Professor Petavel.*) A difference of 170° between the steam and the air heats it more?—Yes, it makes all that difference.

4438. (*Chairman.*) Before passing on to weaving sheds, I think from the discussion that has taken place you have been able to form a pretty good idea of what we are trying to get?—Yes.

4439. I will ask you to say what you would recommend for reducing the temperature in spinning rooms when it gets from 70° to 75° dry bulb—what practical recommendation do you make to keep the spinning room as cool as possible after that temperature is reached?—Blowing cold air in—that is from the outside—is, as far as I know, the best for keeping the temperature down.

4440. How would you blow it in?—By pressure fans along a duct down the centre of the room if there are windows on either side.

4441. What arrangements would you make for your outlet ventilation?—In that case, if they are afraid of dust, I should make each window ——

4442. There is no question of dust?—But if they were afraid of dust coming in I should make each window open with a swing so that the air could get out through the top, because if it is colder air coming in than you are wanting to take out it will drop and rise again to get through the top.

4443. (*Professor Petavel.*) What ratio do you recommend between the size of the duct and the openings to the outside?—I reckon you should not have less than three times the size. That is, taking the area of your duct coming in I should say the outlet should be three times that area. I should not put the room under any pressure at all.

4444. (*Mr. Ewart.*) I understand you to say your inlet is by a duct down the centre of the room?—Yes.

4445. And your outlet by the windows?—By the windows and doors.

4446. How do you manage to get the outlet when there is high wind pressure outside dead on the building?—It is more than likely that might act as a slight inlet; it goes to the other side and baffles the outlet. Although we send the air in about, say, 800 feet a minute velocity, it does not say that by the time it has passed through that room it is going to be passing out at that. It is passing at a very slow rate through the outlet.

4447. (*Chairman.*) Now we will talk about an entirely different class of room—weaving sheds. Probably you are quite familiar with cotton weaving sheds?—Yes.

4448. Are you familiar with sheds in which artificial humidity is introduced?—Only again from the ventilation point of view, and cooling.

4449. Have you had any experience in cooling weaving sheds in which artificial humidity is introduced?—Yes.

4450. Well, in the Irish sheds—some of them at any rate—the limit between the wet and dry bulb thermometer is less than is generally found in cotton sheds?—Yes.

4451. The difference is very often only two degrees?—Yes.

4452. These sheds in hot weather reach very high temperatures, and our object is to recommend some method to cool these sheds. What would you recommend as the most practical way of doing it?—Well, what we have to do—because they have not wanted to spend too much money in the Lancashire district—is to extract with, say, 14-inch fans—just plain extraction—and blow in at different points with 18-inch fans.

4453. (*Mr. Ewart.*) No ducts?—No ducts at all; just a guide at the back of the 18-inch fan to throw it in an upward direction—to spread it really.

4454. Is there any precaution against short-circuiting?—Only that when we put in an 18-inch fan we see that the 14-inch fan is extracting pretty far away so that we get a through run.

4455. (*Chairman.*) Now have you had any complaint in summer that this ventilation makes it difficult for the people to get the humidity necessary for spinning?—No. We have had complaints from the workers that they do not like it, many a time—those working close to, say a blowing-in fan, where the air drops too quickly. Supposing it is something between 32° and 40° outside, and they keep on blowing air in, they find that, working in a fairly warm room, the cold air, not being properly distributed, drops too quickly. I have had that complaint.

4456. They get a cold draught upon them?—Yes.

4457. That is in the winter?—That is in the winter time.

4458. Have you had any complaints of that sort in the summer?—No, they like them in the summer; they like them for fully nine months of the year. It is only on special days when they are getting near freezing point that you get any complaints about draughts.

4459. Is it necessary to run them in the cold weather?—It is, because they are on the same shaft as the main shaft, and they run with the machinery really. Nobody is allowed to touch them.

4460. But the band could be knocked off?—Yes, if they have permission, but most of these people say you have to run the fans all the time the machinery is going.

4461. Is that to keep up the CO_2 standard?—Well, those fans that we have put in have been calculated on 2,000 cubic feet of air per person. That does get over the CO_2 standard; it drops you below the limit all right.

4462. But the CO_2 standard, instead of being 9, as it formerly was, is now 12?—Yes, it has been raised, and that is 11 above the outside.

4463. Not 11 above the outside, 8 above the outside?—In the humidifying it is only 8, I believe, and 11 when there is no humidifying.

4464. Then I take it it would not be necessary to run those fans in the winter?—Well, they always keep on all the extraction fans in the winter all the way through; they make a point of that. Most of the weaving sheds are made now with no other outlet except the fans. They do not want leaks where they do not know where it is going to.

4465. (*Professor Petavel.*) Have you had any experience of ventilating weaving sheds where very high humidity is required?—No, or rather if I have I have not noted it. It has not been of interest. You see we recognise humidity as a special thing, and unless you are going to tackle it properly you must not tackle it at all. A man has said this shed is getting too warm for me, and then I have put in fans suitable to drop the temperature down again. Some of them run up to 19 parts of CO_2 in 10,000, and then I put a fan in.

4466. So if you are asked to cool a shed and a condition was imposed that the humidity should not fall below 90 per cent. you would not deal with it?—I should not tackle it. That is my point. There are people who set themselves out for that work, and they are the right people to deal with it. A lot of them, like Mather and Platt's now, are putting in humidifying plant and they do not tackle the ventilation part, and of course we have been invited in in those cases. There are a lot of people who would tackle both the humidifying and ventilation, and who could give some guarantee of what they are going to do at the finish of it, but I cannot say what would be the effect about the humidifying. You ought to take them as two separate things, temperature and humidity. Put a definite standard for humidity if you like, but put another standard for temperature.

4467. (*Chairman.*) You see unhappily the two things are so closely allied that you cannot separate them in that way?—You can in this sense. You may say "I will not allow you to have a temperature above "95° under any conditions."

4468. Supposing you said you shall not have a temperature above 75°?—Then you would make it so very awkward for them that I do not know whether they could do it for you.

4469. But you said 95°, did you not?—95°, yes. They sometimes get up to over 100°, and that is the time when they are bound, from their own point of view, to put some fans in.

4470. (*Mr. Ewart.*) In factories?—Yes.

4471. (*Professor Lorrain Smith.*) 100° dry bulb, you mean?—I am talking all the time of dry bulb.

4472. (*Chairman.*) In the opinion of medical men nowadays the wet bulb is an important point?—Yes, it is most important, because a wet atmosphere is certainly a more difficult thing to work in than a dry one very much higher, but at the same time they all note on the dry bulb what temperature they are getting.

4473. Our inquiry relates almost entirely to places in which there is a considerable amount of artificial humidity?—Yes

4474. And it is the moisture that makes it an unhealthy atmosphere?—Yes

4475. You can stand a considerable amount of dry heat, but you cannot stand much damp heat?—We do a lot of ventilation in dye-houses. We have a system for that, and there again I note that where they have only a fair amount of moisture you can have your temperature up to 90° and the men are quite comfortable, but where they have several vats steaming at one time that 90° gets very uncomfortable.

4476. Just one other point. It has been suggested to us that the work would be very much more comfortable were means taken to circulate air, even if you do not change the air. If the conditions are such that you cannot change your air any more without interfering with the work it has been suggested to us that by circulating the air there would be a greater degree of comfort to the workers. Have you ever considered that point?—Yes, I suppose there is some truth in that.

4477. How could that be done, say, in a weaving shed?—Well, those things that the Germans use in the cafés are very good. They are just two long arms, that work in the form of a fan, wafting the air down. They press the air down; keep on blowing down from the top. You could do it that way.

4478. You mean a sort of electrical fan like the blades of a screw?—Yes, like an air propeller—just two blades. That could be done, but if the air is already getting uncomfortable, it is just a question how much you would benefit by pushing it down again, because naturally the warmest air will rise to the top.

4479. Has your business ever taken you out to India or any such place?—My father is at the present time in Cape Town engaged on the question of ventilation, and then he is going to Australia. He will get some of the warm climates there.

4480. In India, if you go to any hotel or any club, or any building of any importance, as soon as you sit down you press a button and a fan works over your head?—Yes.

4481. And you feel very comfortable?—Yes, but you are getting a different form of air to what you get in a factory, because in the case of an hotel you get, generally speaking, fairly big and high rooms, and if you are using the air that would not be just the stagnant air round your body, but in the case of a factory the warmest air will stay at the top, and if you have to re-use this air you will be pumping that air down again.

4482. Take a restaurant car when travelling, you generally see a fan there?—Yes, but again there is a different problem, because generally the top of the restaurant car has some inlet or outlet, and the air you are blowing from the top is renewed to some extent, whereas the air lower down has not much movement. I think you would find in a factory you would not gain very much by it. I tried to do that in a bakery where they had another room over, and just in front of the oven the men wanted cooling. They tried to blow air on to the men just to keep them cool while they were filling and emptying the oven, but the thing was quite a failure. I was simply pumping this warm air back on to them, and they preferred to be without the fans as a matter of fact. When I was extracting it was all right.

4483. (*Professor Lorrain Smith.*) In conditions where the air is not renewed and which is a little uncomfortable round you, supposing instead of leaving the men in stagnant and uncomfortable air you begin blowing the air and making it move constantly, have you observed whether that produces comfort?—I should say it does, if you are not taking it from a source where it is already stagnant and waiting for other warm air to take its place.

4484. The difference is between having no movement in the air and having the air round the worker moving?—I should say he would get some benefit if you could take it even from the same level; yes, I should say so, certainly.

4485. The same air?—Yes, he would get some benefit by it moving about, but if you are taking it from the top I should say not. It is a question how much it would be worth to move air round about, because the machinery and the pulleys and that style of thing is more or less moving it already

4486. (*Mr. Ewart.*) I just wanted to ask you, have you in any case where you have put in a ventilating apparatus in a weaving factory had complaints that it interfered with the obtaining of the necessary humidity?—No.

4487. Is that because the amount of air removed or changed has not been very great?—That is so.

4488. That is the reason?—That is so. We hardly interfere with it really from the humidity point of view.

4489. A 14-inch fan, of course, will not do very much?—No, and they are scattered at such a distance too, generally, in a Lancashire weaving shed. If you find a 14-inch fan here it will be 40 feet before you find the next.

4490. I thought you said twenty?—Twenty feet to the fan blowing in, and then 20 feet to the extraction. The extraction fans are scattered actually 40 feet apart with the centre fans blowing into them.

The witness withdrew.

Mr. WALTER YATES called in and examined.

4491. (*Chairman.*) You are a member of the firm of Matthews and Yates?—Yes, managing director.

4492. And your firm are ventilating engineers?—That is so.

4493. You have given, no doubt, a considerable amount of attention to the question of ventilation and humidity?—A good many years.

4494 You probably know that a Committee sat on the question of ventilation and humidity in cotton weaving sheds, and recently reported?—Yes.

4495. And certain legislation has followed?—Yes.

4496. I should explain to you that the Committee sitting at present is inquiring into flax spinning and weaving, and I explain that because I want you to dissociate cotton from flax.—I follow.

4497. I want to ask if you have seen the flax spinning and weaving in the mills in Ireland?—Yes, pretty extensively.

4498. Before coming to weaving sheds I want to ask questions about the spinning rooms. You understand the condition of the wet spinning rooms—that the floors are wet?—Yes.

4499. And that there is a good deal of moisture and spray from the flyers?—Exactly.

4500. And generally speaking, there is much moisture about?—Yes.

4501. Have you noticed that in these rooms there is generally a large amount of natural ventilation in the shape of windows which can be opened?—Yes.

4502. Have you noticed that these windows are generally kept open?—Very frequently, yes.

4503. I think I must explain to you certain conditions that we have found, and having done that, you will understand what we want to remedy. To put it shortly, from the observations kept by the firms, and from our own observation during the summer, we found that in the spinning rooms the temperature goes up to heights which, in the opinion of the medical evidence, is injurious, or likely to be injurious to health. Our object is not to interfere with those rooms until a certain point is reached, where (according to the evidence which will be forthcoming) there will be probable injury to health?—Yes.

4504. Knowing the condition of these rooms, can you suggest any means by which the temperature can be kept down, we will say, when the wet bulb gets to 75°?—The principal method is of course by extracting the vitiated and moist air. We have fans in the windows—open fans—which is good up to a point, but my view is, not as good as methods that have been adopted. I have seen an exceedingly good method at a mill in Belfast, where a box which really forms the creel to support the bobbins is so arranged as to come just over the water trough through which the yarn passes. There is a slot at the bottom of the box, which runs right the length of the water trough, and a fan is attached to the box, extracting and delivering this air to the atmosphere, so that any moisture arising from the water trough is sucked immediately into the box and away to the atmosphere without ever getting into the room.

4505. The object is to carry away any moisture from the troughs?—And at the same time a certain amount of heat, because the water in the trough is warm.

4506 That of course is one of the methods, and a very desirable method, of cooling the room, but assuming that that has been done, or that the steam in the troughs is efficiently closed in and does not escape, and still the temperature goes up very high, can you then suggest anything further?—Yes; there is a method of blowing into the room air which has previously passed through cold water in the form of spray. We are doing that in several instances—not in wet spinning rooms, that I just call to mind, but in other operations. For instance, we are doing it in connection with the weaving in Lancashire.

4507. That is done also for humidifying purposes?—Quite so, it serves the purpose also of cooling.

4508. How would you distribute that air?—By ducts, with apertures at intervals. I believe I have a sketch with an arrangement of that kind here now. This, by the way, is installed in the Jaffe Mill, at Belfast, but not so much for cooling as for supplying the air which is taken from the room by the dust-extracting plant.

4509. (*Professor Petavel.*) That apparatus is not in a spinning room?—It is not in a spinning room, but the same arrangement would carry through in a spinning room—the same distributing arrangement, which was the question asked.

4510. (*Chairman.*) Could you give us an approximate idea of how many degrees you might expect to cool an average spinning room by a method of that sort?—It depends largely on the temperature of the water. We have made careful experiments with an installation recently put in a brewery, especially for cooling the air. We found we could get to within one degree of the temperature of the water; that is, with water at 57° the room was brought down to 58° when the outside temperature was 64° or 65°, but in warmer weather of course a further reduction from ten to fifteen degrees is possible.

4511. What outlet arrangements will you have in the spinning rooms?—If an apparatus were desired purely for cooling the air, and arrangements had already been made as you suggest for keeping the moisture down, then the open windows would suffice because of the volume of air put in by the inlet through the fan; but the first method I mentioned of connecting the water troughs to the boxes behind and extracting from those would serve as the outlet from the rooms, while the distributing apparatus for the inlet would bring in the air.

4512. I am afraid you would not get very much extraction from them, because you see the covers on the troughs are put on very closely to prevent any escape of steam?—You are then assuming there is no mechanical extraction.

4513. Very little I should say. Of course, that particular method, I think, exists at one mill only?—Yes, I believe it was patented, but whether it is still in force I do not know.

4514. But throughout the spinning rooms there are arrangements for confining the steam?—Yes, but if there is no method of taking it away some of it must get into the room. I have never seen any arrangement yet where the steam was so closely confined that some of it did not get into the room.

4515. Perhaps a certain proportion does get into the room, but it would be a very expensive thing to require everybody to take up the method you suggest?—Quite so.

4516. Unless it was shown there was any real harm being done by the very slight escape of steam?—Yes.

4517. So assume for the moment that we have it just in one mill and not elsewhere?—Yes

4518. Then what exhaust method would you suggest for those places?—Fans in the windows; bring the air down the middle of the room and have extraction fans in the windows.

4519. We might recommend a regulation requiring that such a method should be adopted, but would it be desirable to specify some definite linear velocity in order to secure efficiency, because, for instance, the windows might be choked, and the windows might be closed and the fans more or less choked, with very little good resulting?—Quite so.

4520. Unless you could ensure that a certain linear velocity was passing through that trunk?—Then you would have to fix the size of the trunk as well. I should suggest as a better method fixing a regulation number of changes per hour in the room.

4521. How would you word a regulation which would secure that?—Merely that the air in the room shall be changed so many times an hour.

4522. How could we tell that was being done?—By ascertaining the volume of air delivered to or extracted from the room, and comparing that with the cubical contents of the room. For instance, at the Bessbrook

Spinning Company, there was one wet spinning room that had a portion of its area very hot, due to some adjoining room I take it they have some heating medium. I do not just remember the exact circumstances. It is some few years since we put that plant in, but in that circumstance the cubical capacity of the room was 39,500 feet, and the fan we put in to deal with that room was capable of delivering 4,000 cubic feet per minute, which gave (when the 4,000 is multiplied by 60, divided by 39,500, the cubic capacity) six changes per hour. But, as I say, that was only to deal with a small portion of the room; It was not intended as a complete plant for that room. Now in the case of, say, a preparing room—I gave you an instance at the Jaffe Mill—the cubical capacity of one of those rooms is 120,000 cubic feet, and we are putting in air into those rooms, or rather extracting in the first instance, 19,300 feet per minute, which gives nine and a half changes per hour, extracting practically every six minutes.

4523. (*Mr. Ewart.*) That is for dust extraction?—That is dust extracting, of course. Now to provide for that as an inlet we are putting in 12,000 cubic feet, which gives six changes, because there are always doors and other places to supply the remainder.

4524. (*Chairman.*) Supposing you laid down a regulation that the air should be changed a certain number of times, how could an inspector be sure that that was being done? By what method could he tell?—The exact method would be to ascertain by an anemometer the volume of air that a given fan was delivering, either extracting or putting in. The probabilities are that he would take as a standard a certain volume by a given sized fan at a given speed as the volume of that particular size, and if he found a room with that size fan in it, he would take the volume which had become standard and compare that with the cubical capacity.

4525. Now the method you suggest, I understand, is that you should have a fan forcing air through a distributing trunk?—That is so.

4526 And that the air should be distributed where it was most wanted?—Yes

4527. Would it be possible to place an anemometer at some place in that trunk and to then see if the fan was doing the work for which it was intended?—Yes, quite.

4528. You probably say that for ventilating a room of a certain size, and under certain conditions, that the fan should be capable of changing the air a certain number of times, and you would find what the linear velocity was in the trunk to produce that result?—Quite so, and the linear velocity, of course, multiplied by the area of the trunk would give you the cubic capacity.

4529. When that velocity was known, if hereafter the fan was running on the different pulley at a lower speed, or if the exhaust fan was being choked by inefficient exhaust, an anemometer in the trunk would show it?—Quite so.

4530. So the real test would be that the linear velocity in the trunk must run up to the standard shown in the first instance by the anemometer?—Yes, providing in the first instance they have arrived at the cubical discharge by multiplying the linear velocity by the area of the duct.

4531. (*Professor Petavel.*) How would you proceed where there are no ducts?—Just open fans, say, by propellers fixed in windows?

4532. Yes?—Then the inspector would either have to go to the trouble of getting the discharge by the anemometer from the fan or, as I say, take the amount discharged as a standard. Suppose it is a 24-inch fan—most people know what a 24-inch fan will do at a given speed—he might take the speed of the fan, which is easier than taking the linear velocity by anemometer in most cases, and if he is satisfied with the speed of the fan then he will be satisfied the fan is delivering its normal standard volume.

4533. Is not there a considerable difference between the efficiency of different makes of fans?—No doubt, so that it comes to the exact method I mentioned in the first instance, of testing each fan by anemometer.

4534. How would you place the anemometer in an open fan?—It must be tested on the discharge if it is open to the inlet. In most cases a fan discharges in such a case through a trunk in order to get the air through the window. I would then place the anemometer on the outlet point of the trunk. Of course, not in one point; it will have to be taken either across the diameter or over the whole area.

4535. Is it a very convenient operation for the inspector when the room is on the fifth floor?—Not very. I do not think I would care for the job.

4536. (*Chairman.*) It could not be done inside?—Not very easily

4537. It could if it were plenum?—Decidedly.

4538. For exhaust, not Supposing you had a trunk that you could place temporarily over the fan, could not the velocity be measured in that way?—On extract?

4539. Yes?—You would find very considerable difficulty in arranging a trunk that would pass from one to the other. There is a belt drive, and all sorts of things in the way, and to put a trunk on the tips of an air propeller is usually to restrict its output.

4540. I take it the only thing would be to get an original guarantee from the ventilating engineer that assuming the fan were running its proper speed, and so on, a certain result would be produced?—That is one way.

4541. An inspector could not tell the speed at which it is running?—A speedometer is a simple method of getting the speed if there is provision on the shaft end for that purpose, and of course that can be insisted upon; but I do not think there is any better method of cooling than the plenum—blowing the air in and getting it through water.

4542. (*Professor Petavel.*) Supposing you were told there was a mill—for instance, the one of which you have plans—that was now 84° on an average in summer, and you were asked to bring it down to 74°, what kind of installation would you recommend?—Undoubtedly one of this character with a cooling chamber near the fan. That is one method. That is our humidifier, but the same principle applies. During the last 12 or 18 months we have introduced modifications of this arrangement, which involved a larger cooling chamber and more water jets, so that the air is passed through solid spray itself, that is, a mass of spray, in a fairly large area.

4543. (*Mr. Ewart.*) Before you leave that I would like to ask you this. You see ventilation and humidity wet bulb temperature are mixed up in this case. What would be the humidifying effect if you are passing in air six times an hour?—It would increase the humidity.

4544. And give greater cooling?—Quite so.

4545. (*Professor Petavel.*) You are aware of course that a wet spinning room is very moist?—Yes.

4546 Is there the same advantage therefore in humidifying the air before it enters the spinning room as there would be in a weaving shed?—Of course the water is used not so much as a humidifier as a cooler. If it were essential that the humidity should not be increased then it would be desirable and necessary in fact to use some other form of cooling which could be a refrigerator, but then of course it is prohibitive.

4547. (*Chairman.*) The expense is prohibitive?—Quite so, yes. That is a very simple matter of introducing cool air without humidity.

4548. Such as you do in breweries, for instance?—Yes, and in other cases.

4549. But the expense, I take it, is very great?—It is quite prohibitive in the case of the wet spinning room I am sure. I do not know any better method than a large air change, which in itself is one excellent method of cooling, and then the addition of the water.

4550 Would it carry much humidity forward, do you think?—It does some. I cannot tell exactly what. Of course it varies very considerably in different circumstances.

4551. Now we will pass on to weaving sheds. You probably are aware that for weaving the finer class of goods in Ireland the difference between the wet and dry bulb thermometers is only two degrees?—Yes.

4552. Which of course means there is a considerable amount of humidity in the weaving sheds?—That is so.

4553. Now the evidence that we have taken so far rather goes to show that for certain classes of goods, this humidity is a manufacturing necessity?—Yes, I quite agree.

4554. The workers perhaps do not understand matters very well, but they complain about the heat. Of course the heat will be more felt if the atmosphere is humid. We want to reduce the heat if we can. The lower we can get the temperature of the shed the easier it is to get the relative humidity. What would you suggest for cooling such places?—Precisely the same. Of course it is essential to have a large volume of air passing in.

4555. (*Professor Petavel.*) Is it possible to obtain 90 per cent. moisture in a shed at 80° by passing the air over cold water?—No, I should not say so.

4556. There would be a difficulty in getting both the cooling effect and the humidity from the air passing into the shed?—It is being done.

4557. In linen sheds?—I cannot point to a linen shed, no, cotton.

4558. (*Chairman.*) Did you say it has been done?—Yes.

4559. By what method?—By the large volume of air passed in, and by taking that air through cold water for the cooling, and introducing a very small amount of steam to aid the humidity.

4560. (*Professor Lorrain Smith.*) In the shed?—No, into the apparatus; into the same chamber into which the water is spraying, or immediately afterwards.

4561. (*Mr. Ewart.*) Not by raising the temperature of the water itself?—Well, that is another method. Even from warm water you can cool the air. I do not mean hot water, but the very fact of the air taking up the water has a cooling effect.

4562. (*Professor Petavel.*) Have you been able to maintain the right amount of moisture in a shed with cold water humidification through a duct?—No, not to the limit that the Act allows.

4563. Now, with the shed at 80° dry bulb, the cotton cloth regulations allow 77·5 per cent. humidity and the flax regulations allow 90 per cent. humidity?—At 80°?

4564. At 80°. What is your opinion as to the result of this difference on the ease of cooling?—It is difficult to get it; it increases the difficulty. The higher the percentage of humidity required, the greater the difficulty in keeping the temperature down and giving the humidity at the same time.

4565. Would you, as a commercial firm, be willing to guarantee a reduction of 5 or 10 degrees?—Maintaining 90 per cent.

4566. Yes?—I should want to experiment first.

4567. (*Chairman.*) Assuming that injury to health begins at 75° wet bulb, we naturally wish to bring the temperature down to 75°. Is it possible to do that, and, at the same time, to retain the humidity that is necessary for efficient weaving, that is a difference of two degrees?—That is practically the whole question. I do not think it would be possible to undertake, under all conditions, not to exceed 75° wet bulb with a difference of two degrees, that is, 77° dry. With a high outside temperature you might not be able to get down to 75°. I conceive a difficulty in getting down to 75° with a high outside temperature in a very hot summer, for instance; but there is no doubt that an apparatus can be installed which will materially reduce the temperature which would otherwise exist without the apparatus, and that would be due to the large number of air changes, the large amount of fresh air per operative per hour which would be supplied, and the method of obtaining the humidity, getting it mainly from cold water; but of course you could not get 90 per cent. humidity, I am sure, entirely from cold water.

4568. You would have to have some steam with it?—Yes, but not live steam in the open shed.

4569. But let it pass through the duct?—Through an apparatus, yes.

4570. And you think that that would materially reduce the temperature in the shed?—It would; but of course at the same time the fact of changing the air frequently has a very helpful effect from a health point of view.

4571. But assuming the suggestion is a good one, that it will reduce the temperature, what we are afraid of is that we shall not be able to get the moisture. You think we could get the moisture with an apparatus of that sort running?—You may get the 90 per cent. humidity, but, as I say, with a high outside temperature you might not get it down to 75°; but you could approach it.

4572. (*Professor Petavel.*) Taking an average shed, what cooling effect would you be willing to guarantee?—There has not been sufficient of it done to give positive guarantee at the present time, but in one particular case—the summer before last was, I think, a hot one—it was reported to us that the temperature in a given shed had been reduced ten degrees. I should not think there is any serious difficulty in getting that; but of course they were not getting 90 per cent. humidity. This was a Lancashire shed.

4573. (*Professor Lorrain Smith.*) Was it a dry shed?—No. My view is this, regarding linen sheds, that there is such an exceedingly large amount of steam put into them that the latent heat in the steam excessively raises the temperature, and there is very little air change going on at the same time: so that by remedying the thing from two points you get very much better results.

4574. (*Chairman.*) Then you consider that one evil is the introduction of steam?—Yes, of live steam into the open shed.

4575. And the giving off of the latent heat?—Yes.

4576. But as a practical measure, what would you substitute for the steam?—Substitute much more water, as I have suggested, and much less steam.

4577. More water and less steam?—Yes.

4578. But do you think that you could maintain the standard of humidity that is necessary for that fine weaving under that system, a difference of two degrees?—Yes, I quite believe that you may get up to a difference of two degrees more easily by more water and less steam than is now the practice.

4579. And by a system of introducing the combination through trunks and distributing through trunks?—Yes.

4580. That would be a combination of water mixed with steam, and the steam not escaping into the shed, but into the distributing trunk?—Quite, and becoming thoroughly mixed.

4581. You think that would have a cooling effect?—I am sure of it.

4582. (*Mr. Ewart.*) I would like to ask Mr. Yates about his system. Have you factories entirely humidified by your apparatus?—There are one or two in Belfast in the linen.

4583. Are they damask factories?—Yes.

4584. They do not aim at high humidity there. Do you know what, as a general practice, is the number of volumes of air introduced per hour?—Our method, in the case of humidification, is not to reckon on the number of changes in a given shed, but to reckon on the given quantity of air per hour per operative. We find that works out better. Of course that is taken in conjunction with the CO_2. In the work we have done in Lancashire, if it is to be a humidified shed, then there is a limit with CO_2. We have had to undertake to guarantee, of course, that we would so dilute the air in the shed as to bring the CO_2 down to the factory limit, at the same time giving the requisite humidity; and in order to accomplish the two objects—that is, to come up to the Act allowance in humidity and to keep the CO_2 down to the limit—we have found that a given quantity of air introduced and humidified in the way we do it has accomplished what we desired.

The witness withdrew.

APPENDIX A.*

HEALTH STATISTICS, compiled by Professor J. A. LINDSAY.

TABLE A.

Statistics showing the Amount and Character of the Diseases arising amongst the Operatives engaged in the Flax Trade.

Royal Victoria Hospital, Belfast.

Average of two years—1904, 1905.

1. Total number of intern patients . . 2.963

Number of intern patients engaged in flax trade 290

Total number of intern medical cases . 1,084

Number of intern medical cases engaged in flax trade 139

Total number of intern surgical cases . 1,879

Number of intern surgical cases engaged in flax trade 141

2. Analysis of diseases :—

—	Total Number of Cases.	Cases amongst Flax Workers.
Bronchitis . . .	59	14
Pleurisy and pneumonia .	69	6
Heart disease . . .	109	17
Kidney disease . . .	50	6
Gastric ulcer . . .	145	48
Tubercular disease of bones and glands.	179	21
Anæmia	58	26
Rheumatism . . .	70	14

N.B.—The Royal Victoria Hospital does not admit cases of phthisis to intern treatment.

TABLE B.

Statistics relating to Tuberculosis of the Lungs,

1. Amount of hospital accommodation for consumptive patients in Belfast :—

1. Forster Green Hospital . .	38	beds.
2. Throne Hospital . . .	10	„
3. Union Hospital (Dr. Hall's estimate)	250	„
Total . .	298	„

Total number of deaths from pulmonary tuberculosis in Belfast (average of two years) 1,118

Probable number of persons suffering from pulmonary tuberculosis in Belfast . . } 6,000 to 7,000

Irish Local Government Board reckons 10 persons living with pulmonary tuberculosis to each death *Vide* circular of June 1906. This is probably an over-estimate.

Proportion of beds to probable number of patients . . . . . . 1 to 22 or 23

Forster Green Hospital for Consumption (38 beds).

2. Statistics showing proportions of cases arising in the various branches of the linen trade as compared with the rest of the population :—

Year.	Total No of Patients.		Patients engaged in all branches of Linen Trade.		Patients engaged in Flax Spinning Mills.		Patients engaged in Weaving Factories.	
	Intern.	Extern.	Intern.	Extern.	Intern.	Extern.	Intern.	Extern.
1904	193	601	35	86	3	16	12	34
1905	180	525	34	87	6	11	16	37
1906	164	451	23	85	2	24	4	30
	537	1,577	92	258	11	51	32	101

N B.—(1) The total number of persons engaged in the spinning mills and weaving factories is about 35,000.

(2) The total number of persons engaged in all departments of the linen trade (including handkerchief makers, stitchers, and machinists of various kinds) has not been definitely ascertained, but is probably considerably over 40,000.

(3) It will be noted that the proportion of cases amongst persons engaged in the flax spinning mills and weaving factories as compared with those engaged in the subsidiary branches of the linen trade is not high.

(4) The statistics include amongst "stitchers" a number of dressmakers, who have no necessary relation to the linen trade. Hence the above figures somewhat overstate the amount of phthisis arising in the linen trade.

Throne Hospital (10 Beds).

3. Consumption Department.—

Year.	Total Intern Patients	Patients engaged in Flax Trade.
1902	33	12
1903	21	9
1904	32	6
1905	26	9
1906	24	4
	136	40

Royal Victoria Hospital (300 Beds).

4. Out-Patient Department, 1906 :—

The total number of cases of phthisis amongst all occupations . . . 227

The total number of cases of phthisis amongst flax workers 50

Of the 50 cases of phthisis amongst flax workers there was the following incidence of the disease in the different departments of the trade.—

Spinners	8
Weavers	8
Winders	6
Doffers	2
Stitchers	8
Reelers	5
Roughers	2
Lappers	2
Preparers	2
Layers	2
Various (Mechanics, Labourers, &c.) .	5
	50

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* *See* questions 852, *et seq.*

TABLE C.

Statistics showing the amount of accommodation in Belfast for the treatment of Infectious Diseases.

1. Union Hospital	200 beds.
2. Purdysburn Hospital	168 ,,
3. Royal Victoria Hospital	6 ,,
	374

(For cases arising during their stay in hospital for other causes.)

N.B.—The Royal Victoria Hospital, the Mater Infirmorum Hospital, and the two children's hospitals admit a few cases of typhoid fever.

Number of cases of infectious disease notified in Belfast (measles and whooping cough not included):—

Average of three years—1903, 1904, 1905 - 2,620.

Comparative figures:—

—	Population.	Number of Beds for Infectious Diseases.
Edinburgh	303,638	600
Leeds	428,698	660
Liverpool	733,714	938
Belfast	366,220	374

TABLE D.

Statistics showing Diseases of the Respiratory Organs amongst Flax Workers treated in Dr. Hall's Wards at the Union Hospital in the year 1906.

A. Males:—

—	Bronchitis.	Phthisis.
Weavers	3	4
Roughers	3	8
Hacklers	35	14
Spinners	2	1
Drawers	—	1
Yarn Dressers	—	3
Yarn Bundlers	1	5
Machine Boys	—	6
	44	42

B. Females:—

Weavers	9	21
Rovers	3	13
Spinners	12	38
Doffers	—	5
Drawers	—	9
Reelers	8	9
Preparers	5	2
Winders	9	6
Spreaders	4	3
Carders	2	3
	52	109

Total number of cases treated during the year	3,860
Total number of cases of bronchitis	485
Total number of cases of bronchitis amongst flax workers	96
Total number of cases of phthisis	848
Total number of cases of phthisis amongst flax workers	151

APPENDIX B.*

STATISTICS of DISEASES amongst MILL and FACTORY WORKERS, compiled by Dr. J. E. MACILWAINE, M.D.

PERIOD, TWO YEARS 1910–1911.

Total Figures Given.

Occupation.	Royal Victoria Hospital, Intern Patients 1910–1911.							Forster Green Hospital, Intern and Extern, 1910–1911.	Notifications under Tuberculosis Prevention Act, 1910–1911.
	Bronchitis.	Pleurisy and Pneumonia.	Cardiac.	Kidney.	Gastric.	Anaemia.	Rheumatism.	Phthisis.	
1. Total cases 1910–1911	120	167	358	124	298	97	170	1,540	1,500
2. Spinners including layers and Doffers.	5	12	14	3	21	5	20	49	119
3. Other mill-workers, rovers, drawers, carders, preparers, spreaders.	6	2	3	1	13	5	7	18	63
4. Reelers	3	2	8	5	24	10	9	24	27
5. Weavers	6	12	23	3	29	9	13	55	75
6. Winders	2	4	15	4	11	2	10	29	11

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* See Questions 1057, *et seq.*

APPENDIX C.*

VITAL STATISTICS of BELFAST, compiled by Dr. WILLIAM BURNS.

TABLE A.

Occupations of 91 persons suffering from Pulmonary Tuberculosis in the Year 1910 and 91 persons treated during 1911.

Belfast Urban XV.

	1910	1911.
Spinners	28	18
Weavers	9	10
Winders	2	2
Reelers	2	4
Drawers	3	5
Rovers	1	—
Doffers	1	2
Dressmaker	—	1
Labourers	19	27
Carter	3	—
H. W.	5	—
Sailors	1	1
Smoother	1	2
Servant	2	—
Tailor	2	—
Blousemake	1	—
Charwoman	2	—
Stitcher	2	4
Messenger boy	2	1
Ironmoulder	1	2
Book-binder	1	—
Flax-dresser	3	1
Bobbin-builder	—	1
Machine boy	—	2
Plumber	—	1
Painter	—	1
Tobacco spinner	—	3
Vice-folder	—	1
Sack sewer	—	1
Total	91	91

TABLE B.

700 Patients treated in the Extern Department of F. Green Dispensary for Chest Affection for the Year 1912, revealed the following facts :—

Doffers	7
Millworker	4
Reelers	9
Rovers	4
Spinners	15
Spreader	3
Weavers	18
Winders	12
Total	72
H. W.	110
Labourers	63
No occupation	88

402 persons suffered from pulmonary tuberculosis.

TABLE C.

Death Rates in Belfast and Urban Districts per 1,000 living at the different age Periods.

1911. Population 386,947.

Under 5 Years.	5–25.	25–45.	45–65.	65.
45·67	4·45	9·8	28·38	73·8

Death rate for city, 17·2.
Density, 26·3 persons to acre.

Urban XII Population, 38,076.
Working-class District with very few Mill Workers.

Under 5 Years.	5–25.	25–45	45–65.	65.
49·7	4·63	11·37	25·2	72·53

Death rate for district, 17·2
Density, 36 people to acre.

Urban III. Population, 50,032.
Mixed Working-class District with a large number of Mill Workers.

48	5	9·5	28·5	80·4

Death rate for district, 17·68.
Density, 70 persons to acre.

Urban V. Population, 16,112.
Largely Mill Working Class.

57	5·69	15·9	39	80·73

Death rate for district, 23·15.
Density, 112 persons to acre.

Urban XV. Population, 22,669.
Practically Mill Working Class.

72	5·14	10·98	49·1	65·9

Death rate for district, 23·38.
Density, 106 persons to acre.

TABLE D.

Death Rates in Belfast and Districts for the various Diseases mentioned per 1,000 persons living for the Year 1911.

—	Pneumonia.	Other Diseases of Respiratory System.	Pulmonary Tuberculosis.
Belfast	1·21	2·0	2·07
Urban XII.	*0·8*	*2·75*	*2·44*
Urban III.	*1·98*	*2·27*	*2·49*
Urban V.	*1·73*	*2·9*	*2·66*
Urban XV.	*2·00*	*1·8*	*3·17*
Liverpool	*1·97*	2·22	1·6
Scotland Division	—	—	*2·6*
Exchange „	—	—	*3·9*

TABLE E.

Birth Rates.

Belfast	28·4
Urban XII.	35·5
Urban III.	28·3
Urban V.	31·9
Urban XV.	28·9
Liverpool	30

TABLE F

Number of Spinners and Weavers in Belfast.

Spinners.		Weavers.	
M.	F.	M.	F.
2,736	11,313	1,569	9,264

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* *See* questions 3276, *et seq.*

APPENDIX D.*

OBSERVATIONS taken during July 1913 with WET and DRY BULB THERMOMETERS and KATA-THERMOMETERS; indoors and outdoors; at seaside; in London, and in Weaving Sheds and Spinning Rooms.†

Observations were taken with the Kata-thermometers not only in the atmosphere, but also between the skin and shirt of individuals exposed to the atmosphere.

TABLE 1.

Observations in Factories.

Factory.	Process.†	Position.	Conditions.			Kata-thermometer Readings. Rate of Fall in Seconds (110°—100°).	
			Temperature.		Relative Humidity. (Per cent.)		
			D.B.	W.B.		Dry	Wet
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
			°	°			
A	W.	In shed	80	75	75	214	62
—	—	Out of doors; fine sunny day	—	—	—	59	27
B.	S.	In room	82	71	54	215	56
—	—	Do.	78	71·5	70	180	48
C.	D.	In dressing room	107	86	35	420*	31
—	W.	In shed	81	79	90	187	63
D.	W.	In part of shed where looms were stopped	85	84	95	231	76
—	—	Refreshment room (railway station)	—	—	—	159	41
—	—	Hotel (evening)	—	—	—	145	45
E.	W	In shed	81·5	80	93	218	60
F.	S.	In warmest corner 2 yards from spindles	86	82	80	266	71
”	”	Over troughs	86	82	80	247	58
”	”	9 inches in front of spindles	86	82	80	226	53
”	”	Middle of stand near spindles	76	73	84	175	48
”	”	Do. do do.	76	73	84	150	47
”	”	In room (engine going)	85	84	95	213	76
”	”	Do. (engine stopped)	88·5	82·5	73	302	72
”	”	Out of doors; ideal lovely sunny day with breeze.	—	—		85	25

* 110°—107·5°.

† S. = Spinning. D. = Dressing. W. = Weaving

TABLE 2.

Observations at Seaside.

Temperature.		Kata-thermometer, Rate of Fall, 110°—100° (Seconds).		Conditions.
Dry Bulb. (1)	Wet Bulb (2)	Dry. (3)	Wet. (4)	(5)
°	°			
63	61	167	41	Out on a cliff in sun; warm sunny day; no breeze. Comfortable sitting with coat off.
62	59	127	48	Bright sunny day; gentle breeze; indoors.
64	61	63	26	Out on cliff
60	58	131	43	Indoors.
59	57	33	20	Out on cliff. N E wind, fairly strong, bracing, coldish.
61	59	120	53	Indoors; cloudy.
59	57	43	20	Out on cliff; cool gentle breeze.
62·5	58	145	49	Indoors. } Thin clouds, mild gentle sea breeze.
62	58	67	28	Out on cliff
62·5	60	141	47	Indoors. } Cloudy, gentle sea breeze, pleasant.
62·5	60	57	27	Out on cliff.

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* *See* questions 3515–3596.

† A full account of the use of the Kata-thermometer will probably be published shortly by the Local Government Board under the title "Report on Ventilation and Effect of Open Air and Wind on the Respiratory Metabolism," by Professor Leonard Hill F R S

Table 3.

Contrast on same Day of Seaside and London.

Seaside, out on Cliff.					London, out on Roof or in Garden				
Temperature.		Kata-thermometer Readings (Seconds). 110°—100°.		Conditions.	Temperature.		Kata-thermometer Readings (Seconds) 110°—100°		Conditions.
Dry Bulb. (1)	Wet Bulb. (2)	Dry (3)	Wet. (4)	(5)	Dry Bulb (6)	Wet Bulb. (7)	Dry. (8)	Wet (9)	(10)
°	°				°	°			
64	61	61	26	Bright, sunny.	71·5	65	127	45	Bright sunny day.
62	60	57	26	Cloudy, gentle breeze.	70	63	112	37	Sunny, warm, very gentle breeze.
60	58	19	32	Strong, gusty N.E., overcast.	59	54	53	24	Overcast, cold breeze.
59	57	50	24	Overcast, windy, spitting with rain.	64	55·5	79	32	Sunny, breezy.
62	58	45 73	29	Overcast, variable, gentle breezes, at times none.	—	—	115	37	Cloudy, warm, almost no breeze.
62·5	57·5	59	23	Bracing N. wind, sunny.	—	—	94	30	Sunny, warm, breezy.
54	53	40	27	Coldish dull day.	—	—	101	38	Cloudy, moist, cool slight breeze.

Table 4.

Effect of Fan in Experimental Chambers.

Conditions of Experiment.	Temperature of Chamber.		Kata-thermometer.		
			Position.	Rate of fall 110° — 100° (Seconds).	
(1)	Dry Bulb. (2)	Wet Bulb. (3)	(4)	Dry. (5)	Wet (6)
	°	°			
Fan off - -	90—91·5	84—86	In air of chamber - -	680	146
Fan on - -	94	82	,, ,, - -	482	95
,, - -	92—92	87—88·5	Under cotton shirt - -	912	274
,, - -	92—95	88—86	,, ,, ,, - -	465	149
,, - -	94—96	84—86	,, ,, ,, and linen coat	752	133
Fan off - -	95	83	Under sweater* - - -	855	229
Fan on - -	96	83	,, ,, † - - -	454	84

* Much sensible sweating. † No sensible sweating.

TABLE 5.

Comparison between Flax Spinning and Weaving Rooms and Seaside.

Place of Observation.	Temperature		Rate of Fall of Kata-thermometer (Seconds).				Person Experimented on.	Description of Clothing.
			Atmosphere (110°–100°).		Between the Skin and Shirt (110°–105°).			
	Dry Bulb	Wet Bulb.	Dry.	Wet.	Dry.	Wet.		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	°	°						
Weaving shed - - -	80	75	214	62	231	57	Man -	Flannel shirt, waistcoat
Spinning room - - -	82	71	215	56	267	51	Child -	Cotton blouse and skirt. Bare feet.
" " - - -	78	71½	180	48	265	45	Man -	Flannel vest, vest with cotton coat.
" " - - -	78	71½	180	48	179	39	Girl -	Very thin open cotton blouse, bare feet.
Weaving shed - - -	81	79	187	63	238	64	Boy -	Shirt, boots, and stockings.
Sea-side Ideal, sunny bracing day, N.E off wind. Indoors.	63	60	138	50	147	96*	—	Cellular meshed cotton shirt.
Same day. On cliffs -	65	68	59	26	81	65*	—	Cotton shirt.
Seaside. Cool, strong wind. Indoors	60	58	131	43	105	142*	—	" "
Same day. On cliff - -	60	58	33	20	35	44*	—	" "

* 110°—100°.

INDEX TO MINUTES OF EVIDENCE.

A —SPINNING.

Air Samples:
- Results of sampling, (*Eraut*) 15–17.

Aprons:
- —— provided and worn, (*Hamilton*) 1303, (*Morrison*) 1443, (*Adams*) 1584, (*Crawford*) 1976, (*Gordon*) 3351, (*Slocock*) 3708.
- —— objected to at fine frames, (*Crawford*) 1977.
- —— unnecessary where splash-guards are used. (*Operative*) 4024–6.
- Waterproof —— oppressive, (*Williams*) 2840, (*Purdon*) 3232–3, (*Hill*) 3549–51, 3581, 3584.
- Canvas or sacking —— should be substituted for waterproof material, (*Martindale*) 2726, (*Williams*) 2840–1, (*Hill*) 3581–4, (*Slocock*) 3710–20, 3788–95.
- Light oilskin used for ——. (*Ricardo*) 3428.
- Light cotton overalls should be used instead of ——, (*Hill*) 3545–57.
- Several —— should be provided for each spinner, (*Martindale*) 2733.
- —— should be washed periodically, (*Martindale*) 2733.

Beading:
- —— of yarn, due to water being too cold, (*Hamilton*) 1392–3, (*Morrison*) 1494–1500, (*Gordon*) 3404–7.
- —— of yarn, due to air being too cold, (*Adams*) 1646–52.

Bibs:
- —— not worn as required, (*Eraut*) 90–101, (*Galway*) 281–5, (*Eraut*) 1164–7, 1173, (*Hamilton*) 1304, (*Morrison*) 1444–6, (*Crawford*) 1977, (*Martindale*) 2722, (*Gordon*) 3352–3, (*Ricardo*) 3429–30, (*Slocock*) 3706–8, 3792.
- —— uncomfortable, and therefore not worn, (*Operative*) 2508–15, 2537–9, 2582–6, 2612, (*Martindale*) 2723, (*Ricardo*) 3434–5, (*Slocock*) 3709.
- —— worn on compulsion, (*Adams*) 1585–6.
- Responsibility of occupier as to wearing of ——, (*Eraut*) 1173–5.
- Waterproof material not suitable for ——, (*Martindale*) 2724.
- Canvas suggested as alternative for ——, (*Martindale*) 2726–32, 2734–5, (*Williams*) 2842.
- Omission to wear —— might lead to injury, (*Lindsay*) 826–8.

Carbon Dioxide (*see* **Air Samples,** *and* **Ventilation**).

Chemical Treatment of Yarn:
- —— adopted by one firm, (*Hamilton*) 1376–7, (*Morrison*) 1516–7.
- —— tried, but not successful, (*Morrison*) 1515–6.
- —— not tried, (*Hamilton*) 1386–7, (*Adams*) 1604.

Climatic Conditions (*see* **Meteorological Conditions**).

Clothing:
- Accommodation for ——:
  - Cloak-rooms should be easy of access, (*Eraut*) 102–8, (*Galway*) 286–98, 309–12, (*Slocock*) 3721.
  - Cloak-rooms should be provided when possible, (*Williams*) 2830.
  - Cloak-rooms not always possible owing to want of space, (*Martindale*) 2738.
  - Cloak-rooms provided for some of the spinners, (*Hamilton*) 1413.
  - Cloak-rooms, clothes collected and deposited in, by doffers, (*Hamilton*) 1416.
  - Cloak-rooms used after some persuasion, (*Hamilton*) 1413–4.
  - Cloak-rooms not used by spinners, (*Hamilton*) 1476–82.
  - Difficult to provide in old mills, (*Williams*) 2831–8.
  - Various methods described, (*Eraut*) 1178–82.
  - Boxes adopted, (*Operative*) 4013–23, 4080, 4106–7, 4150–2, 4206–7.

Clothing—*continued.*
- Accommodation for ——*continued.*
  - Boxes in passes not satisfactory, (*Martindale*) 2739–43.
  - A separate box should be allotted to each spinner, (*Operative*) 4214–9.
  - Boards adopted, (*Operative*) 4330–1, 4360–4.
  - Empty soap barrels adopted, (*Operative*) 4252–7.
  - Cupboards in passes not satisfactory, (*Morrison*) 1472–5, 1483–5.
  - Cupboards desirable and possible in some rooms, (*Martindale*) 2745.
  - Metal lockers desirable, (*Slocock*) 3721–3.
  - Boots not worn, (*Galway*) 271–4
- Change of —— desirable, (*Eraut*) 101, (*Lindsay*) 868.
- Change of —— made before leaving, (*Operative*) 2553–9.
- Change of —— not made before leaving, (*Operative*) 2617.
- Change of —— made on return home, (*Operative*) 2588–96
- Change of —— impracticable, (*Slocock*) 3777.
- Danger of wet ——, (*Eraut*) 98–100, (*Galway*) 276–81, 326, (*Lindsay*) 829, (*MacIlwaine*) 1097–105.
- Nature of ——, discussed, (*Hill*) 3545–57, (*Slocock*) 3722–9.

Comfort of Operatives:
- —— increased by use of splash-guards, (*Martindale*) 2711.
- No discomfort felt in spinning rooms, (*Operative*) 2522–3, 2547–50, 2626–32.
- Discomfort noticed at high temperatures, (*Slocock*) 3770–1.

Complaints:
- —— received as to humidity and temperature, (*Martindale*) 2767, 2774, (*Slocock*) 3771.
- —— received as to wet floors, (*Martindale*) 2767.
- —— received as to cold, but not as to heat, (*Adams*). 1638–41.
- No —— received, (*Purdon*) 3217, (*Burns*) 3297.
- Absence of —— due to early age of beginning work, (*Martindale*) 2773, 2775–80.

Cooling of Spinning Rooms:
- —— should be adopted, (*Burns*) 3297.
- Method of ——, compared with that of cotton rooms, (*Sutcliffe*) 4391–99.
- Exact degree of —— for given amount of ventilation difficult to forecast, (*Sutcliffe*) 4421–8.
- Suggested methods of ——
  - By increased ventilation, (*Martindale*) 2693, 2703, (*Williams*) 2815–6
  - By plenum trunk ventilation, (*Sutcliffe*) 4409–20, 4439–46.
  - By local extraction of hot air and steam, (*Yates*) 4504–5
  - By combination of plenum and exhaust ventilation, (*Yates*) 4511–21.
  - By introduction of air cooled by passage through water, (*Yates*) 4506–10, 4542–50.
  - Cooling effect of local exhaust, (*Yates*) 4504–5.
  - Cooling effect of conditioned air, (*Yates*) 4506–10, 4542–50.
  - Cooling effect of plenum and exhaust system, (*Yates*) 4511–21.
  - Cooling effect of cold water, very small, (*Sutcliffe*) 4429–37.

Draughts:
- Spinners sensitive to ——, (*Hamilton*) 1325, (*Adams*) 1640–1.
- Duct distribution tends to prevent ——, (*Hamilton*) 1353–8, (*Sutcliffe*) 4420.
- —— would result from too high a degree of ventilation, (*Sutcliffe*) 4406.
- Yarns detrimentally affected by ——, (*Hamilton*) 1408–9, (*Morrison*) 1519–20, 1534–9.

Flax:
- Nature of —— determines temperature of water in troughs, (*Morrison*) 1447–50.

Floors:
- —— wet in spinning rooms, (*Galway*) 267–71, (*Purdon*) 3207–8, (*Gordon*) 3350.
- —— wet even with splash-guards, (*Gordon*) 3363–6, (*Ricardo*) 3426–7.
- —— wetter in coarse rooms than in fine, (*Adams*) 1575.
- Wetness of —— depends on relative humidity, (*Williams*) 2843–5.
- Methods of preventing wet ——
  - By making floors concave, (*Hamilton*) 1333–6, (*Adams*) 1580.
  - By making floors arched, (*Martindale*) 2763.
  - By use of channels, (*Morrison*) 1465–6, (*Adams*) 1579.
  - By use of splash-guards, (*Martindale*) 2691, 2712, (*Operative*) 3987–98, 4366–9.
  - By frequent sweeping, (*Adams*), 1576.
  - —— should be kept drier, (*Andrews*), 3934.

Health of Operatives (*see also under* **General**)**:**
- Spinners reported healthiest in mill, (*MacIlwaine*) 1096, 1108–12, (*Morrison*) 1430.
- Spinners very healthy, (*Hamilton*) 1367–70, (*Adams*) 1614–6, (*Operative*) 2501–2, 2532–5, 2606–8, (*Ricardo*) 3455–9.
- Spinners not unhealthy, (*Purdon*) 3222.
- Spinners not specially subject to chest complaints, (*Andrews*) 3922, 3932–3.
- Spinners not specially subject to phthisis, (*Lindsay*) 832–52.
- Spinners not specially subject to any disease except perhaps phthisis and rheumatism, (*MacIlwaine*) 1061, 1091.
- Spinners recruited from healthy class, (*Lindsay*) 808–11, 815–8.
- Children appear healthy on examination, (*MacIlwaine*) 1076–90, (*Purdon*), 3217, 3235–41.
- Improved during recent years, (*Lindsay*) 800–1.
- Spinners sometimes suffer from sore feet, (*Galway*) 266, (*Hamilton*) 1375–8, (*Slocock*) 3780–1.
- Spinners subject to gastric ulcer, (*Lindsay*) 853.
- Spinners not up to general average of ——, (*Lindsay*) 884*a*.
- —— could be improved by better education, (*Lindsay*) 856–7.
- —— dependent on causes outside occupation, (*Lindsay*) 804–6, (*MacIlwaine*) 1093–4, 1113–4.
- Effect of conditions of labour on ——, (*Lindsay*) 801–5, 812–4, 832–53.
- Exposure to abrupt changes of temperature undesirable, (*Lindsay*) 854–5.
- —— detrimentally affected by exhaustion, (*Lindsay*) 830–1, (*Slocock*) 3771

Heating, Means of:
- —— none in spinning rooms, (*Hamilton*) 1330–2, (*Morrison*) 1453.

Heat, Sources of:
- —— in spinning room described, (*Crawford*) 1994–2006.

Humidity:
- —— arises from troughs and spray, (*Morrison*) 1432–3, 1440–2.
- More —— in coarse than in fine spinning, (*Adams*) 1545–6.
- Excessive —— could be reduced by use of splash-guards, (*Martindale*) 2690–1, (*Williams*) 2821–3.
- Excessive —— could be reduced by prevention of escape of steam, (*Williams*) 2817–8.
- Excessive —— could be reduced by increased ventilation. (*Williams*) 2828.

Humidity, Relative:
- —— of air in spinning rooms—
  - Should not be too high, (*Morrison*) 1501–2, 1509, (*Adams*) 1625–30.
  - Should be high for certain yarns, (*Andrews*) 3922, 3942–4.
  - Is important in fine spinning, (*Adams*) 1619–22.

Humidity, Relative—*continued.*
- —— of air in spinning rooms—*continued.*
  - Is not important, (*Hamilton*) 1404–5, (*Gordon*) 3368–72, (*Ricardo*) 3422.
  - Has no effect on spinning, (*Crawford*) 1989–93, 2014–25.
  - Depends on dampness of floors, (*Williams*) 2843–5.
- —— of four degrees difference is satisfactory, (*Adams*) 1631, (*Gordon*) 3369, (*Andrews*) 2961–2, (*Operative*) 4203, 4371.
- —— of five to ten degrees difference is common, (*Slocock*) 3696–7.
- —— of seven or eight degrees difference is satisfactory, (*Operative*) 4039–43, 4263–5.
- —— of ten or twelve degrees difference does not affect spinning. (*Operative*) 4204–5.

Meteorological Conditions:
- Spinning affected by ——, (*Hamilton*) 1406–7.
- Spinning detrimentally affected by dry winds, (*Adams*) 1595, 1643–5.
- Temperature of room should vary according to ——, (*Andrews*) 3945, 3963–5.

Moisture (*see* **Humidity**).

Records of Humidity:
- Exemption from keeping —— not often claimed, (*Adams*) 1632–7.
- Exemption from keeping —— claimed by some mills, (*Crawford*) 1986–8

Splash-guards:
- —— objected to by spinners, (*Eraut*) 81–95, (*Galway*) 299–303, (*Morrison*) 1474, (*Adams*) 1588, (*Crawford*) 1982–3, (*Williams*) 2925–8.
- —— objected to by spinners at first, (*Martindale*) 2710.
- —— injure the arms, (*Hamilton*) 1337–42, 1371–4, 1379–80, (*Morrison*) 1471, 1521–2, (*Adams*) 1589, (*Operative*) 2926.
- —— interfere with "laying on," (*Eraut*) 1171, (*Gordon*) 3354–62, 3375–7, (*Ricardo*) 3423–5, 3448–52, (*Andrews*) 3935–9.
- —— interfere with "piecing," (*Morrison*) 1525, 1530–1, (*Operative*) 2622–5.
- Spinners refuse to use ——, (*Gordon*) 3373–4.
- —— used only after compulsion, (*Eraut*) 1168.
- —— do not keep floors dry, (*Gordon*) 3363–6, 3380–3, (*Ricardo*) 3426–7.
- —— impossible in some mills, (*Eraut*) 1172.
- Stands sometimes too narrow for ——, (*Crawford*) 1980, (*Martindale*) 2718–9, (*Williams*) 2825–7.
- Minimum width of stand for use of ——, (*Eraut*) 1177.
- —— not objected to by spinners, (*Operative*) 4011–2, 4058–62, 4117–31, 4176–92, 4235–51, 4295–310, 4340–6.
- —— not objected to by spinners if properly constructed, (*Williams*) 2927–8.
- —— do not interfere with work after experience, (*Martindale*) 2710.
- —— Do not injure the arms, (*Operative*) 4096–103, 4153–5, 4158.
- —— increase comfort of workers, (*Martindale*) 2711.
- —— less objectionable to tall women than to short, (*Ricardo*) 3453–4
- —— would prevent excessive humidity, (*Martindale*) 2690–1, 2703, 2712–3.
- —— should be universal, subject to exceptions, (*Eraut*) 1176–7.
- —— should be adopted for frames of 2-inch pitch and over, (*Martindale*) 2708, (*Slocock*) 3702–5.
- —— should be tried, (*Operative*) 2599–603.
- Types of —— described, (*Eraut*) 1168–71.

Steam, Escape of:
- Means of preventing —— described
  - By means of local exhaust, (*Eraut*) 175.
  - By use of dippers, (*Hamilton*) 1307–10, (*Morrison*) 1434–8, (*Adams*) 1556–65, (*Williams*) 2817–8, (*Gordon*) 3396–8, (*Slocock*) 3698–700.
  - By use of tubes, (*Operative*) 4032.
- —— occurs though not apparent, (*Eraut*) 1142.
- —— efficiently prevented, (*Martindale*) 2706.
- Prevention of —— adds to comfort, (*Operative*) 4031–3, 4132–3.

Steam Pipes:

A small length of —— usually left uncovered, (*Eraut*) 1145, (*Adams*) 1564.

Covering of —— makes air of room too moist, (*Morrison*) 1503–8.

Covering of —— usually efficient, (*Martindale*) 2705.

Covering of —— sometimes inefficient and insufficient, (*Williams*) 2811.

Covering of —— cannot be legally required, if pipes used for conveying hot water, (*Williams*) 2811.

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—— used in spinning explained, (*Herdman*) 935–42

"Laying on" and "piecing" distinguished, (*Morrison*) 1526–9.

Temperature, Air (*see also* **Cooling,** *and for* Temperature of Water in Spinning Troughs, **Water**):

—— frequently high, (*Williams*) 2806, (*Purdon*) 3206.

Instances of —— found in spinning rooms, (*Eraut*) 1136–40, 1145–53, 1182, (*Hamilton*) 1314–9, 1326–9, (*Gordon*) 3335–6, 3348–9, (*Ricardo*) 3420–1, (*Slocock*) 3679–81, 3767–9, (*Operative*) 4038, 4040, 4194–7, 4258–62.

Best —— for spinning—

70° to 80° for certain yarns, (*Andrews*) 3922–30, 3940–1, 3956–8

70°, (*Operative*) 4198–201, 4372–4.

Difficult to fix, (*Morrison*) 1451–2, (*Adams*) 1590–4.

—— should be higher on frosty days, (*Andrews*) 3958–60, 3963–6.

—— important in spinning certain yarns, (*Andrews*) 3945–55.

—— not an important matter, (*Hamilton*) 1322–5.

—— affected by temperature of troughs, (*Adams*) 1589–74.

—— should be reduced, (*Burns*) 3297.

—— unnecessarily raised by inefficient steam pipe covering, (*Williams*) 2811.

—— unnecessarily raised by bad control of the temperature of the water, (*Williams*) 2811.

Temperature, Body:

—— of children raised, (*Purdon*) 3209–21, 3234–5.

Troughs (*see also* **Steam, Escape of**):

—— radiate much heat, (*Eraut*) 1141–4, (*Williams*) 2811.

—— do not radiate much heat, (*Adams*) 1568–9.

Method of heating —— described, (*Gordon*) 3384–95, 3401–2.

Cleansing of —— recommended, (*Eraut*) 49–59.

Ventilation (*see also* **Air Samples** *and* **Cooling**):

Systems of —— in use described, (*Morrison*) 1454–64, (*Adams*) 1596–603, (*Crawford*) 2007–13, (*Gordon*) 3312–34, 3337–47, (*Ricardo*) 3414–9, (*Slocock*) 3682–6, (*Operative*) 4044–9, 4266–85, 4347–59.

Plenum and exhaust systems —— combined, (*Hamilton*) 1343–51, 1359–63.

Danger of short-circuiting, (*Hamilton*) 1364–6.

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Usual system of —— criticised, (*Williams*) 2828.

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Water:

Purity of ——

No complaint against present requirement, (*MacIlwaine*) 1131–3, (*Martindale*) 2759–60.

Present requirement should apply to drip feeds, (*Eraut*) 81–3.

Nature of —— important in spinning, (*Eraut*) 89, (*Hamilton*) 1394–8, (*Morrison*) 1510–4.

Water—*continued.*

Temperature of —— in troughs—

120° to 170°, (*Hamilton*) 1388–93, (*Andrews*) 3925.

Up to 180°, (*Morrison*) 1439.

Higher for coarse than fine yarns, (*Hamilton*) 1389–90.

Varies with kind of flax, (*Morrison*) 1447–50, (*Gordon*) 3403–4.

Varies with kind of yarn, (*Adams*) 1553–5, (*Gordon*) 3378–9, 3403–4.

Varies unnecessarily, (*Williams*) 2811–4

Sometimes unnecessarily high, (*Martindale*) 2704, (*Slocock*) 3700.

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Cold —— used for spinning, (*Eraut*) 69–70, (*Hamilton*) 1397–403.

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Windows (*see* **Ventilation**).

B.—WEAVING.

Air Samples:

Results of sampling, (*Eraut*) 16–38, (*Martindale*) 2662–5, (*Williams*) 2906–7.

Ballot of Lancashire Weavers:

References to ——, (*Drennan*) 2383–9, (*Leathem*) 2460–4, (*Andrews*) 3904.

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Cloth:

Fine and coarse —— woven by the same weaver, (*Leathem*) 2482–5.

Classification of different kinds of ——, impracticable, (*Leathem*) 2480–1, (*Slocock*) 3741–5, 3747.

Clothing of Operatives:

Accommodation for ——

Cloakrooms provided in some mills, (*Eraut*) 110.

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Comfort of Operatives:

Discomfort felt in weaving, (*Tenter*) 198–201, (*Operative*) 373–402, 604, 725–46, 2952–5, 2996–7, 2999–3000, 3067–81.

Some discomfort felt on hot days, (*Lutton*) 1910–7, (*Leathem*) 2449–50.

Discomfort begins at a dry bulb temperature of 80°, (*Leathem*) 2451–2.

Exhaustion felt after end of work, (*Operative*) 2937–8, 3001, 3073, (*Purdon*) 3198–9, (*Operative*) 3825–6.

Something might possibly be done to increase ——, (*Leathem*) 2494–8.

No discomfort felt in weaving, (*Operative*) 2040, 2043–50, 2059–60, 2074–5, 2117–23, 2133, 2147–8, 2165–70, 3052–6.

No discomfort felt at 80° wet bulb, (*Andrews*) 1220–1, (*Greeves*) 1723–7.

No exhaustion felt after end or work, (*Operative*) 3887–97.

Only one weaver ever left on account of heat, (*Addy*) 2248–50.

Conditions in linen and cotton weaving compared, (*Williams*) 2921–2.

Complaints:

—— received as to heat and moisture, (*Galway*) 313–27, (*Slocock*) 3730.

—— received as to excessive humidity, (*MacDowell*) 3501–3.

—— received as to insufficient humidity, (*Leathem*) 2433.

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Complaints—*continued.*
- —— more frequent in weaving than in spinning. (*Martindale*) 2753.
- —— more frequent as to insufficient than as to excessive humidity, (*Leathem*) 2471–3, (*MacDowell*) 3489–91.
- No —— received from weaving sheds, (*Tenter*) 234–6, (*Spence*) 1829–33, (*Lutton*) 1918, (*Addy*) 2251–2, (*Drennan*) 2378, 2412–3.
- No reluctance in making ——, (*Lutton*) 1920.
- Paucity of —— compared with Lancashire, (*Slocock*) 3755–66, 3784–5.

Cooling of Weaving Sheds:
- Methods of ——
  - Water spray for roofs, (*Operative*) 604.
  - Water spray for roofs, not tried, (*Drennan*) 2349.
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  - Efficient ventilation, (*Andrews*) 1222–6, (*Greeves*) 1718–20, 1725, (*Williams*) 2849, 2859–60.
  - Drawing incoming air through wet screens, (*Addy*) 2234–5.
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Cotton Cloth Factories Regulations:
- Applicability of —— to flax—
  - As to humidity records, (*Eraut*) 165–74
  - As to accommodation for clothing, (*Eraut*) 121–5, (*Operative*) 485–7, (*Slocock*) 3724–5.
  - As to limitation of humidification, (*Tenter*) 237–42, (*Operative*) 417, (*Lutton*) 1941–5.
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Dressing, Yarn:
- Purpose of —— described, (*Herdman*) 1006–11.
- —— rooms very hot but dry, (*Drennan*) 2413–4.

Experiments:
- —— to be conducted by Committee, (*Lutton*) 1946–7.
- —— on effect of humidity on weaving, described, (*Addy*) 2292–324, 2335, (*Macartney*) 3117–27, 3147–59, 3167–83.
- —— on effect of humidity on linen and cotton, described, (*Drennan*) 2361–6.

Floors:
- —— frequently wet in weaving sheds, (*Operative*) 471, 616, 636–7, 652, (*Martindale*) 2767–8
- —— not kept clean in weaving sheds, (*Operative*) 789
- —— should be kept dry, (*Operative*) 2946, 3089.
- Slightly damp —— indication of best weaving conditions for cambrics, 2400–4.

Health of Operatives:
- Effect of heat moisture on——
  - Cause of ill-health. (*Operative*) 462, 472, 482, 514–30, 590–6. 635–6, 664–8, 775–7.
  - Cause of colds and fever, (*Operative*) 488–91.
  - No opinion as to ——, (*Eraut*) 7–8, (*Tenter*) 204.
- Effect of damp floors on ——, (*Operative*) 662–3.
- More sickness in summer than in winter, (*Tenter*) 235–6.
- Weavers in humid sheds quite healthy, (*Andrews*) 1235, (*Addy*) 2244–6, (*Drennan*) 2378–82, (*Operative*) 3886–97.
- Weavers in humid sheds are able to continue long at work, (*Macartney*) 3140–6.
- Statistics show that tenters do not suffer ill-health, (*MacDowell*) 3478–81, 3487–8, 3504–8.
- Statistics show better attendance in humid than in dry shed. (*Andrews*) 1235–51.
- —— improved by substitution of humidifier for steam, (*Operative*) 575–9.

Health of Operatives—*continued.*
- Exposure to abrupt changes of temperature undesirable, (*Lindsay*) 864–7.
- Conditions in cotton and linen weaving compared, (*Williams*) 2803–5, 2923–4.

Heating of Weaving Sheds:
- Uncovered pipes used for —— kept on all night, (*Greeves*) 1692–6

Humidification, Artificial (*see also* **Humidity, Relative**):
- —— necessary in weaving, (*Eraut*) 9–11, (*Operative*) 366–72, 459, 474. 492–7, 531, 604, 681, 701–6, 759–61, 779, (*Herdman*) 967–9, (*Andrews*) 1203, (*Greeves*) 1639), (*Lutton*) 1867, (*Operative*) 2031–9, 2105, 2150. 2179, (*Williams*) 2798–800, (*Operative*) 2945. 2958–61, 3006–7, 3045–8, 3066, 3863.
- —— most essential for fine goods, (*Herdman*) 970–1.
- Cessation of —— detrimentally affects weaving, (*Operative*) 2041–2, 2050, 2060–73, 2131–2, 2154–62, 2171–2, 2184, (*Addy*) 2292–324, (*Macartney*) 3118–27.
- —— prevents production of dust, (*MacDowell*) 3493.
- —— asked for by weavers, (*Herdman*) 976–7, *Andrews* 1281–2, (*Drennan*) 2368.
- No agitation against ——, (*Herdman*) 991–4.
- —— could not be replaced by sizing, (*Herdman*) 1006, 1009.
- —— could not be replaced by chemical treatment of yarn, (*Herdman*) 1010–1, 1015–8, (*Lutton*) 1949–53.
- Limitation of ——
  - Attitude of operatives towards
    - Against limitation, (*Tenter*) 216, 242–5, (*Herdman*) 988.
    - For limitation, (*Galway*) 338–51, (*Operative*) 444–7. 474, 498–504, 546–8, 610–6, 674–80.
    - Should be discovered by visiting, (*Herdman*) 994, 1002.
  - Would affect earnings (*Operative*) 3836–7.
  - Should be required at a certain temperature, (*Slocock*) 3736, 3746.
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  - Impracticable at 75° wet bulb, (*Andrews*) 1272–80, (*Spence*) 1845–6, 1849–50, (*Lutton*) 1941–5, (*Addy*) 2230. (*Drennan*) 2357–60, (*Leathem*) 2443–8, 2466–71.
  - Possibility of —— depends on reduction of temperature. (*Addy*) 2231–3.
- —— not necessary for fine goods, when hand-woven, (*Operative*) 2965–7.
- —— carried on to an unnecessary degree, (*Operative*) 2961–4. 2985.
- —— excessive in early morning, (*Operative*) 3853–4.
- —— objected to by Lancashire weavers, (*Williams*) 2795–7.

Humidification, Methods of:
- —— described, (*Spence*) 1798–803, (*Addy*) 2208–12, 2325–34, (*Drennan*) 2351–6, (*Leathem*) 2427–30, (*Operative*) 3830.
- —— compared, (*Andrews*) 1214–6, 1252–71, (*Yates*) 4572–82.
- No data as to relative merits of ——, (*Herdman*) 996–8.
- Steam-jets the most satisfactory form of ——, (*Leathem*) 2497.
- Steam jets better than cold moist air, (*Drennan*) 2391–5.
- Patent humidifier preferable to steam-jets, (*Operative*) 563–75, (*Spence*) 1801–2, (*Slocock*) 3738–40.
- Cold water humidifier preferable to steam-jets, (*Operative*) 3002–5.
- Cooling effect of water, (*Andrews*) 1216–8, (*Williams*) 2848. (*Operative*) 3012–3, (*Yates*) 4554–67, 4570–1.
- Cooling brought about by change of ——, (*MacIlwaine*) 1192.
- Water might not produce sufficient humidity, (*Yates*) 4555–7, 4562–6, 4567–9.
- "Degging" practised, (*Operative*) 697–700, (*MacDowell*) 3502.
- "Local" —— not tried in linen weaving, (*Herdman*) 1012–4, (*Macartney*) 3184–5.

Humidity, Relative:
  Best degree of —— for weaving—
    2° difference for plain weaving, (*Andrews*) 1209, 1229, (*Operative*) 3824.
    2° difference essential for cambrics, (*Greeves*) 1667, (*Drennan*) 2410–1
    2° difference in summer and one in winter, (*Tenter*) 205–12.
    2° difference sufficient at high temperatures only, (*Greeves*) 1738–43, (*Spence*) 1819–22, (*Addy*) 2257, (*MacAlister*) 3675, (*Operative*) 3845, 3864–72
    2° difference and sometimes 1½°, (*Leathem*) 2431–2
    2° difference even for boiled yarns, (*Brabazon*) 3611–4, 3664–9.
    2° or 3° difference for fine goods, (*Operative*) 405–29, (*Macartney*) 3108–10, 3116, 3161–3.
    Not more than 2½° for fine goods, (*MacDowell*) 3486, 3509–10.
    2½° to 3° difference for union goods, (*Addy*) 2257–62.
    4° difference for damask weaving, (*Andrews*) 1201.
    The higher the better, (*Herdman*) 975, 981.
    Should be determined by experiment, (*Herdman*) 985–90.
    Sometimes difficult to maintain, (*Andrews*) 1211–3, 1232–4, (*Lutton*) 1947, (*Addy*) 2263–4, (*Leathem*) 2433–4.
    Difficult to maintain without raising temperature, (*Addy*) 2273–6, (*Leathem*) 2457–9.
    Easier to obtain at low temperatures, (*Williams*) 2858.
    Difficult to obtain at high temperatures, (*Spence*) 1825, 1832–3, (*Lutton*) 1871–7.
  Excessive —— bad for weaving, (*Operative*) 548–62, 617–24, 642–6, 651–4, 707–15, 765–78, (*Spence*) 1856–7, (*Lutton*) 1903–9, 1954–60, (*Operative*) 3014–9, 3026–51, 3066, 3844.
  Excessive —— causes warp to adhere to shell, (*Drennan*) 2369, (*Leatham*), 2472–3.
  Excessive —— not bad for weaving, (*Greeves*) 1768–9, 1773–5.
  Excessive —— avoided by manufacturers, (*Herdman*) 1003–4.
  Insufficient —— bad for weaving, (*Leathem*) 2432–3.
  2° difference sometimes exceeded, (*Slocock*) 3782.
  Higher —— required for fine than coarse goods, (*Tenter*) 201–9, (*Addy*) 2285–8, (*Drennan*) 2415–7, (*Leathem*) 2479–80, (*Macartney*) 3111, (*MacDowell*) 3494–5, (*Operative*) 3816–23.
  Higher —— required for coarse than fine goods. (*Operative*) 367–72, 3030–44
  Higher —— required for closely set linens, (*Addy*) 2288–91.
  Higher —— required for linen than for cotton, (*Drennan*) 2361–6, (*Operative*) 3904–9.
  Higher —— required on some days than on others, (*Operative*) 2986, 3082.
  Impossible to weave with less than present allowance of ——, (*Spence*) 1845–6, 1851–5, (*Lutton*) 1868–7.
  Higher —— with more ventilation desirable, (*Drennan*) 2395–400.
  With low —— the extra work more than counteracts greater comfort, (*MacDowell*) 3482–5, 3499–500.
  Experiments with various degrees of ——, (*Addy*) 2292–324, 2335, (*Macartney*) 3117–27, 3147–59, 3167–83.
  Experiments with cotton and linen, described, (*Drennan*) 2361–6.
  Bad effects of insufficient —— on weaving, (*Leathem*) 2432–3.

Meetings:
  —— of weavers, (*Spence*) 1834–8, (*Lutton*) 1921–40

Meteorological Conditions:
  Influence of —— on weaving, (*Herdman*) 1027–45, (*Andrews*) 1284–8, (*Hamilton*) 1411–2, (*Greeves*) 1785–90, (*Lutton*) 1878–84, (*Addy*) 2256–7, 2265–72.
  Influence of —— on earnings, (*Operative*) 3837, 3845, 3848–52, 3869–84.
  Weaving best in summer, (*Tenter*) 184.
  Weaving bad in east winds (*Tenter*) 230–2.

Moisture, (*see also* **Humidification, Artificial,** *and* **Floors**):
  Condensed —— present in weaving sheds, (*Operative*) 430. 594–5, 616, 630, 638–9, (*Martindale*) 2767–8) (*Operative*) 2941, 2968. 3051, 3084, (*Slocock*, 3748–9

Seats:
  —— recommended for weavers, (*Galway*) 304–8, 333–7, (*Martindale*) 2746–8. (*Slocock*) 3796–802.

Spraying of Roofs:
  —— recommended for sheds, (*Operative*) 604.
  —— tried but not very successful, (*Williams*) 2853.

Roofs, Cavity and Double:
  —— useful for keeping down temperature, (*Williams*) 2852.

Records of Humidity:
  Procedure as to —— prescribed by Cotton Cloth Regulations criticised, (*Eraut*) 150–74.
  Procedure as to —— prescribed by Cotton Cloth Regulations might lead to victimisation, (*Operative*) 628–9.
  Procedure as to —— prescribed by Cotton Cloth Regulations would be ineffectual, (*Martindale*) 2677–89, (*Williams*) 2911–20.
  —— do not always correspond with actual readings, (*Operative*) 604, 624–5, (*Williams*) 2909.
  Present system of keeping —— should be abolished, (*Williams*) 2910.
  Substitution of recording instrument for —— advocated, (*Eraut*) 152, 158–60, (*Operative*) 626–8.

Steam Pipes:
  —— covered with asbestos, (*Drennen*) 2350.

Steaming (*see* **Humidification, Artificial,** *and* **Humidifying, Methods of**).

Technical Terms:
  —— explained, (*Tenter*) 362–5, (*Herdman*) 901–34, 943–63, (*Eraut*) 1183–4, (*Addy*) 2261, (*Macartney*), 3112–5.
  Coarse and fine weaving defined, (*Brabazon*) 3600–3.

Temperature:
  Examples of —— found in weaving sheds, (*Tenter*) 185–98, (*Operative*) 388, 470, 539–45, 604, 655, 718–22, (*Eraut*) 1183–94, (*Andrews*) 1219–21, (*Greeves*) 1677–91, 1697–717, (*Spence*) 1827–8, (*Lutton*) 1889–902, (*Addy*) 2214–29, (*Drennan*) 2370–7, (*Leathem*) 2453–6, (*Operative*) 2987–95, 3093–7.
  Best —— for weaving—
    70°, (*Tenter*) 221–33, (*Lutton*) 1932–3.
    65° to 70° wet bulb, (*Tenter*) 781–3.
    65° to 70° wet bulb for coarse goods, (*Herdman*) 978–80.
    65° to 72° wet bulb, (*Operative*) 531–8, 648–50.
    68° to 72°, (*Andrews*) 1267–71, (*Spence*) 1823–5.
    70° to 72°, (*Lutton*) 1885–8, (*Leathem*) 2440–2.
    75° to 80° wet bulb, (*Operative*) 723–4.
    75° to 80° wet bulb for fine goods, (*Herdman*) 972–5, 1019–26
    72° to 73°, (*Addy*) 2213, (*MacDowell*) 3509.
    not less than 70°, (*Greeves*) 1667–74, 1698–9.
  Same relative humidity more effective at high —— than at low, (*Andrews*) 1253, (*Greeves*) 1671, 1740, (*Spence*) 1856, (*Macalister*), 3666.
  Necessary —— for weaving—
    Not less than 60°, (*Macalister*) 3666–7.
    Not less than 70° (*Greeves*) 1667–74.
  —— low in winter, (*Operative*) 2969, 3093 100.
  —— should be kept down, (*Operative*) 2947–51, (*Slocock*) 3738, (*Operative*) 3835–71.
  Low —— objected to by weavers, (*Spence*) 1839.
  Excessive —— occurs in weaving sheds, (*Martindale*) 2753–7, (*Slocock*) 3726–9.
  Reduction of —— (*see* **Cooling**).

Ventilation (*see also* **Air Samples**):
- Present standard of —— discussed, (*Williams*) 2861–94.
- Present standard of ——, no difficulty in maintaining, (*Herdman*) 999–1001.
- Present standard of —— seems to supersede general requirements, (*Slocock*) 3688–92.
- Method of —— discussed, (*Williams*) 2361–94.
- Systems of —— described, *Spence* 1804–13, (*Addy*) 2196–207, (*Drennan*) 2344–6, (*Leathem*) 2423–6, (*MacArtney*) 3133–7.
- Plenum and exhaust systems of —— compared, (*Andrews*) 1225–8.
- Cooling effect of ——, (*Williams*) 2849, 2859–60.
- —— insufficient in weaving sheds, (*Operative*) 3009–11.
- —— desirable in weaving sheds, (*Operative*) 483, 601, 670, 673, 751, 784, (*Drennan*) 2389–90, (*Operative*) 3827.

Water:
- Purity of ——
  - Impure —— used for humidifying, (*Eraut*) 40–9.
  - No complainst against —— present requirement as to, (*MacIlwaine*) 1131–3, (*Martindale*) 2749–52.
- Drinking —— should be supplied, (*Martindale*) 2749–52.

Whitewashing of Roofs:
- —— not legally required but generally carried out, (*Eraut*) 1185, (*Andrews*) 1222, (*Leathem*) 2486–92, (*Williams*) 2850.

Yarn:
- Green and boiled —— compared, (*Brabazon*) 3605–52, (*MacAlister*) 3654–63

C.—GENERAL AND INDEFINITE.

Air Movement:
- —— adds to comfort of operatives, (*Greeves*) 1726, (*Hill*) 3528–34, 3539–41, 3543, (*Sutcliffe*) 4483–5.
- —— affects weaving detrimentally, (*Greeves*) 1726–7.
- Methods of obtaining —— described, (*Hill*) 3585–8, (*Sutcliffe*) 4476–82.

Carbon Dioxide:
- Proportion of —— in air not a suitable measure of ventilation, (*Hill*) 3559–61.

Comfort of Operatives:
- —— largely a matter of habit, (*Hill*) 3580.
- —— increased by air movement (*see* **Air Movement**).

Complaints:
- —— as to heat and moisture received, (*Galway*) 257–67, (*Martindale*) 2697–701, 2767–74.
- —— as to heat and moisture begin when the wet bulb temperature reaches 80° F., (*Martindale*) 2781–2.
- —— as to heat and moisture are specific, not general, (*Martindale*) 2789.

Cotton Cloth Factories Regulations:
- Applicability of —— to flax industry, (*Eraut*) 165–74, (*Tenter*) 237–42, (*Operative*) 417.

Health of Operatives:
- Effect of heat and moisture on ——, (*Eraut*) 7–8, (*Lindsay*) 869–92, 895, (*MacIlwaine*) 1127, (*Hill*) 3577–9.
- Effect of acclimatisation to conditions on ——, (*Martindale*) 2781–6.
- Effect of conditions of work on ——, (*Purdon*) 3231.

Health of Operatives—*continued*.
- Effect of economic conditions on ——, (*Ricardo*) 3440–7.
- Effect of housing conditions on ——, (*Burns*) 3273–5.
- Effect of excessive tea drinking on ——, (*Purdon*) 3223–8, 3273–1.
- Flax workers specially subject to anæmia, (*Lindsay*) 851–5, 864–7.
- Flax workers specially subject to rheumatism, (*Lindsay*) 877–85.
- Flax workers not well nourished, (*Martindale*) 2636–49.
- Flax workers not of good physique, (*Purdon*) 3270.
- —— not up to general average, (*Lindsay*) 884*a*, (*Hill*) 3575–6.
- —— not up to general average, but for causes other than conditions of work. (*Burns*) 3288–9.
- Statistics relating to —— discussed, (*Burns*) 3276–303, (*MacDowell*) 3178–81, 3487–8, 3504–8.
- Illnesses cannot be definitely ascribed to conditions of work, (*Burns*) 3266–9.
- Exposure to cold not necessarily a cause of ill-health, (*Hill*) 3596.
- Infection of operatives discussed, (*Hill*) 3562–5.
- Weavers enjoy better conditions than spinners, (*Purdon*) 3230, (*Slocock*) 3783.
- No definite facts as to ——, (*Purdon*) 3230, (*Slocock*) 3783.

Hygrometers:
- —— sometimes out of order. (*Eraut*) 1148–53, (*Martindale*) 2673.
- —— sometimes badly placed, (*Eraut*) 1157–61.
- —— should be legible, (*Williams*) 2908.
- Present order for —— already anticipated, (*Eraut*) 1154–61.
- Present order for —— should be extended to flax, (*Martindale*) 2674–6.

Kata-thermometer:
- Method of using —— described, (*Hill*) 3522–7, 3567–72.
- Readings of —— in air, (*Hill*) 3535–8, 3542.
- Readings of —— under clothing, (*Hill*) 3543–4.
- Readings of —— in experimental chamber, (*Hill*) 3558.
- Interpretation of —— readings, (*Hill*) 3589–96.

Respirators:
- Regulations as to —— useless, (*Martindale*) 2764–6.

Temperature:
- Minimum —— affected by exhaust ventilation, (*Eraut*) 126–48, (*Martindale*) 2672.
- Minimum —— not always maintained as required, (*Martindale*) 2671–2.
- No limit imposed on —— by Regulations, (*Slocock*) 3733.

Temperature, Body:
- —— of operatives at work should be taken, (*MacIlwaine*) 1124–7, (*Purdon*) 3201–3, 3244–5.

Ventilation:
- Present standard of —— useful requirement, (*Martindale*) 2650–4.
- Present standard of —— generally complied with (*Williams*) 2906–7.
- Standard of —— should not supersede general requirement, (*Slocock*) 3687–91.
- Carbon dioxide standard of —— not suitable, (*Hill*) 3560.
- Standard of —— in terms of fan delivery discussed, (*Williams*) 2867–94.